CANADIAN THESES ON MICROFICHE

THÈSES CANADIENNES SUR MICROFICHE

National Library of Canada
Collections Development Branch

Canadian Theses on
Microfiche Service

Ottawa, Canada
K1A 0N4

Bibliothèque nationale du Canada
Direction du développement des collections

Service des thèses canadiennes
sur microfiche

NOTICE

The quality of this microfiche is heavily dependent upon the quality of the original thesis submitted for microfilming. Every effort has been made to ensure the highest quality of reproduction possible.

If pages are missing, contact the university which granted the degree.

Some pages may have indistinct print especially if the original pages were typed with a poor typewriter ribbon or if the university sent us an inferior photocopy.

Previously copyrighted materials (journal articles, published tests, etc.) are not filmed.

Reproduction in full or in part of this film is governed by the Canadian Copyright Act, R.S.C. 1970, c. C-30. Please read the authorization forms which accompany this thesis.

THIS DISSERTATION
HAS BEEN MICROFILMED
EXACTLY AS RECEIVED

AVIS

La qualité de cette microfiche dépend grandement de la qualité de la thèse soumise au microfilmage. Nous avons tout fait pour assurer une qualité supérieure de reproduction.

S'il manque des pages, veuillez communiquer avec l'université qui a conféré le grade.

La qualité d'impression de certaines pages peut laisser à désirer, surtout si les pages originales ont été dactylographiées à l'aide d'un ruban usé ou si l'université nous a fait parvenir une photocopie de qualité inférieure.

Les documents qui font déjà l'objet d'un droit d'auteur (articles de revue, examens publiés, etc.) ne sont pas microfilmés.

La reproduction, même partielle, de ce microfilm est soumise à la Loi canadienne sur le droit d'auteur, SRC 1970, c. C-30. Veuillez prendre connaissance des formules d'autorisation qui accompagnent cette thèse.

LA THÈSE A ÉTÉ
MICROFILMÉE TELLE QUE
NOUS L'AVONS REÇUE

NL 339 (r. 86/09)

Canadä

0-315-19485-5

141

National Library of Canada

Bibliothèque nationale du Canada

Canadian Theses Division

Division des thèses canadiennes

Ottawa, Canada
K1A 0N4

67393

PERMISSION TO MICROFILM — AUTORISATION DE MICROFILMER

- Please print or type — Écrire en lettres moulées ou dactylographier

Full Name of Author — Nom complet de l'auteur
WAYNE L STRONG

Date of Birth — Date de naissance
NOV 23 1951

Country of Birth — Lieu de naissance
U.S.A.

Permanent Address — Résidence fixe
12323 - 103 STREET
EDMONTON, Alberta
T5G 2K4

Title of Thesis — Titre de la thèse
~~Below-ground Ecology of Boreal Forests in the Hondo~~ -
- ~~Lesser Slave Lake Area, Alberta~~
Below-ground Ecology of Boreal Forests in the Hondo -
Lesser Slave Lake ~~Area~~ AREA, Alberta

University — Université
University of Alberta

Degree for which thesis was presented — Grade pour lequel cette thèse fut présentée
Ph.D.

Year this degree conferred — Année d'obtention de ce grade
1984

Name of Supervisor — Nom du directeur de thèse
George H. La Roi

Permission is hereby granted to the NATIONAL LIBRARY OF CANADA to microfilm this thesis and to lend or sell copies of the film.

The author reserves other publication rights, and neither the thesis nor extensive extracts from it may be printed or otherwise reproduced without the author's written permission.

L'autorisation est, par la présente, accordée à la BIBLIOTHÈQUE NATIONALE DU CANADA de microfilmer cette thèse et de prêter ou de vendre des exemplaires du film.

L'auteur se réserve les autres droits de publication; ni la thèse ni de longs extraits de celle-ci ne doivent être imprimés ou autrement reproduits sans l'autorisation écrite de l'auteur.

Date
10 October 1984

Signature
WL Strong

NL-91 (4/77)

THE UNIVERSITY OF ALBERTA

BELOW-GROUND ECOLOGY OF BOREAL FORESTS IN THE HONDO-LESSER SLAVE LAKE AREA, ALBERTA

by

Ⓒ WAYNE L STRONG

A THESIS
SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
OF DOCTOR OF PHILOSOPHY
IN
PLANT ECOLOGY

DEPARTMENT OF BOTANY

EDMONTON, ALBERTA
FALL, 1984

National Research Council Canada
Research Journals
Publishing Department
Ottawa, Canada
K1A 0R6

Conseil national de recherches Canada
Journaux de la recherche scientifique
Service de publication

File Reference 2400-5

19 April 1984

Wayne L. Strong
Department of Botany
The University of Alberta
Edmonton, Alberta
T6G 2E9

Dear Mr. Strong:

In response to your letter of April 15, permission is granted by the National Research Council of Canada to reproduce the articles "Rooting depths and successional development of selected boreal forest communities" and "Root-system morphology of common boreal forest trees in Alberta, Canada" which were published in the Canadian Journal of Forest Research, as a part of your Ph.D. dissertation. Barbara Drew, Manager of the NRCC Research Journals, has also signed the enclosed release form granting the University of Alberta permission to reproduce single copies of your thesis which include these articles.

Please write again if you should require anything else.

Sincerely

K Dole

Karan Dole
Manager's Assistant
NRCC Research Journals

Canada

THE UNIVERSITY OF ALBERTA

RELEASE FORM

NAME OF AUTHOR	WAYNE L STRONG
TITLE OF THESIS	BELOW-GROUND ECOLOGY OF BOREAL FORESTS IN THE HONDO-LESSER SLAVE LAKE AREA, ALBERTA
DEGREE FOR WHICH THESIS WAS PRESENTED	Ph.D.
YEAR THIS DEGREE GRANTED	1984

Permission is hereby granted to THE UNIVERSITY OF ALBERTA LIBRARY to reproduce single copies of this thesis and to lend or sell such copies for private, scholarly or scientific research purposes only.

The author reserves other publication rights, and neither the thesis nor extensive extracts from it may be printed or otherwise reproduced without the author's written permission.

(SIGNED) ....

PERMANENT ADDRESS:

12323 - 103 Street
Edmonton, Alberta
T5G 2K4

DATE 6 October 1984

THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled "Below-ground Ecology of Boreal Forests in the Hondo-Lesser Slave Lake Area, Alberta" submitted by Wayne L Strong in partial fulfilment of the requirements for the degree of Doctor of Philosophy in Plant Ecology.

Geoff H. La Roi
Dr. G.H. La Roi
Supervisor

Walter Moser
Dr. W. Moser

Kenneth O. Higginbotham
Dr. K.O. Higginbotham

Donald J. Pluth
Dr. D.J. Pluth

P.A. Addison
Dr. P. Addison

Keith Van Cleve
Dr. K. Van Cleve

Date 5 October 1984

ABSTRACT

Root profiles of 11 Boreal Mixedwood forest stands were examined in an attempt to improve our knowledge of northern forest ecosystems. These stands formed 4 distinctive successional sequences based on differences in vegetation composition and substrate characteristics: a Jack Pine (*Pinus banksiana* Lamb.), 2 Aspen (*Populus tremuloides* Michx.), and a Black Spruce (*Picea mariana* (Mill.) BSP.) Series. The Jack Pine and first Aspen Series occurred on well-drained aeolian sand deposits with Eutric Brunisolic soils; the Black Spruce Series occupied poorly drained, organic filled, inter-dunal depressions; the second Aspen Series occurred on clay loam morainal deposits with Gray Luvisolic soils. Stand ages ranged from 19 to 177 years.

Roots were concentrated in the upper 2 dm of the rooting zone in all stands. Densities ranged from 11,000 to 30,000/m^2 of vertical soil surface. Many of these roots were located within the litter layers of the soil and decreased in number with increasing depth at an exponential rate. This near-surface location appears to provide the most favorable combination of soil temperature, nutrients, and moisture for many vascular plants. Rooting depth was greatest in sandy soil and shallowest on organic soils. Some deep-rooted species, such as balsam fir (*Abies balsamea* (L.) Mill.), aspen, and jack pine, were able to tap deep

ground water.

In 1982, plant water potentials in the various forest stands decreased during late May and June from their spring high. With increased precipitation in July, plant and soil water potentials became less negative. Shallow-rooted ericaceous and/or evergreen species such as *Vaccinium* spp. and *Pyrola asarifolia* Michx. had the widest range of water potential during summer, whereas deep-rooted species such as *Alnus crispa* (Ait.) Pursh had the narrowest range of values. White spruce (*Picea glauca* (Moench) Voss) was an exception. Despite its shallow-rooting, it had plant water potentials similar to *Alnus*. A correlation of plant and soil water potentials indicated that most boreal plants depend upon moisture from near the ground surface. The variation in rooting depths among species is thought to represent a niche partitioning mechanism.

An analysis of root density and soil nutrients indicated that root densities were most strongly correlated with the distribution of phosphorus. This suggests that phosphorus may be a limiting factor to biological productivity in the study area. Organic matter, ammonium, nitrate, sulfur, and soil water-holding capacity were significantly correlated ($P<0.01$) with each other but only with root density in seral aspen communities.

Successional changes occur below as well as above-ground. For example, increased white spruce content in aspen and jack pine stands results in changing litter composition, microclimatic conditions, root position, and moss cover. The development of a moss cover is thought to play a significant role in the successional process by restricting the flow of nutrients and water to the roots of seral species. The preemptive growth of white spruce roots into the moss layer and above aspen roots further reduces the flow of nutrients downward to seral species. Such nutrient deprivation promotes the senescence of the seral species while fostering the growth of climax species. This moss buildup may also represent a mechanism for regulating and stabilizing the internal cycling of nutrients in boreal forest ecosystems.

In addition to the below-ground niche partitioning of seral and climax species, separations occur amongst co-existing climax species (e.g., white spruce and balsam fir).

ACKNOWLEDGEMENTS

The author thanks Dr. George H. La Roi for his academic and financial assistance throughout this project. In addition, his true interest in vegetation analysis and our many discussions were highly stimulating. I would also like to thank Drs. K.O. Higginbotham (Forest Science), W. Moser (Botany), D.J. Pluth (Soil Science), J. Mayo (formerly with Botany), and K. Van Cleve (Forest Soils Laboratory, University of Alaska) for their participation as members of the supervisory committee.

Ms. Dorothy Leszczynski, Deanna McCullough, and Sylvia Dupuis provided invaluable assistance during the field work stage, while Suzanna Hubler assisted with laboratory analyses and data preparation. Mr. J. Derek Johnson (Canadian Forestry Service) and Dr. Diana Horton (formerly with Botany) identified Carex and bryophyte specimens, respectively. Drs. M.B. Dale (Botany) and M.V.H. Wilson (Zoology) adviced on statistical techniques.
Dr. D. Chanasyk (Soil Science) provide valuable discussion with respect to the calibration of Coleman blocks.
Ms. Renee La Roi drew several sketches of tree root systems which were eventually published. Manfred Bichlmaier, Heather Addy, Larry Flanagan, Linda Parker, James Fyles, and Randy Shopik assisted with tree excavation and sampling.

This study was supported in part by: Employment Canada through its Summer Canada Project Nos. 2177 WP3 and 2130 XP1; Boreal Institute for Northern Studies Grant No. 55-30119 and supplimentary assistance; Alberta Environmental Research Trust Grant No. T0460; and the University of Alberta. The Research Management Division of Alberta Environment (RMD-80/35A) and the Natural Sciences and Engineering Research Council of Canada (A-7238) assisted with accommodation and logistical support during the field stages. These latter two grants were held exclusively by Dr. G.H. La Roi.

TABLE OF CONTENTS

Chapter Page

I. INTRODUCTION 1

II. ROOTING DEPTH AND SUCCESSIONAL DEVELOPMENT OF SELECTED BOREAL FOREST COMMUNITIES 5

Abstract 5

Introduction 6

Study Area 7

Methods 11

Results 13

Stand Description 13

Rooting Depths and Densities 22

Discussion 30

Succession 30

Rooting Systems 32

III. ROOT-SYSTEM MORPHOLOGY OF COMMON BOREAL FOREST TREES IN ALBERTA, CANADA 37

Abstract 37

Introduction 38

Methods 40

Results 43

Black Spruce 43

Larch 50

White Spruce 50

Aspen 52

Jack Pine 55

Balsam Fir 58

Discussion 60

Horizontal Roots 62

Vertical Roots 63

Succession 66

IV. SEASONAL PLANT-SOIL WATER RELATIONSHIPS IN SELECTED BOREAL FOREST COMMUNITIES OF CENTRAL ALBERTA 69

Abstract 69

Introduction 71

Study Area 73

Methods 75

Results 81

Temperature 81

Precipitation 85

Average Plant Water Potentials (Ψt) 85

Rooting Depth and Minimum (Ψt) 96

Soil Matrix Potential (Ψm) 99

Plant Ψt Correlations 101

Discussion 108

V. ROOT DENSITY - SOIL RELATIONSHIPS IN SELECTED BOREAL FOREST COMMUNITIES OF CENTRAL ALBERTA 119

Abstract 119

Introduction 120

Study Area 121

Methods 123
    Field Procedures 123
    Laboratory Procedures 124
    Multivariate Statistical Procedures 127
Results 128
    Soil Profile Descriptions 128
    PCA and Correlation of Soil Variables 135
Discussion 140
VI. INTEGRATION 147
Hypotheses 147
Rooting Depths on a Global Basis 149
Successional Trends in the Boreal Forest 153
VII. CONCLUSIONS 157
REFERENCES 163
APPENDIX I. ROOT PROFILE DATA 183
APPENDIX II. PLANT WATER POTENTIAL DATA AND
CORRECTIONS 266
VITA 309

LIST OF TABLES

Table Page

1 Stand Age and Selected Site Conditions 12

2 Vegetation Composition, Cover Classes and Floristic Characteristics based on Species with >50% Frequency by Plot 14

3 Root Densities in 11 Boreal Forest Stands of the Hondo-Lesser Slave Lake Area in Central Alberta, based on Measurements in Seven Pits per Stand 25

4 Comparison of Regression Slope Angles and Intercepts of the Root Density/Depth Relation of 11 Boreal Forest Stands of the Hondo-Lesser Slave Lake Area in Central Alberta, using the GT2 Method and Student's t-test 28

5 Stand Age and Selected Site Conditions 44

6 Tree Characteristics and Percent Biomass of Morphological Components by Species 45

7 Predicted and Measured Tree-Biomass Values 61

8 Monthly Air Temperature (Stevenson Screens) and Precipitation Estimates from Two Meteorological Stations during the Summer of 1982 83

9 Mean Air and Soil Temperatures (°C) for Summer of 1982 by Plot in the Hondo-Lesser Slave Lake Area 84

10 Summary of 1982 Summer Precipitation for

Hondo Site and Slave Lake Townsite 92
11 Partial (r) and Multiple (R) Correlations of Plant Water Potential with Precipitation and Soil Water Potentials at Three Depths 102
12 Means and Standard Deviations of Soil Nutrient and Physical Characteristics by Successional Grouping 129
13 Summary of Correlations by Sign and Successional Grouping 141
14 Rooting Depths of Global Ecosystems Arranged Along A Gradient from Humid Tropical to Xeric Desert Vegetation 150

LIST OF FIGURES

Figure Page

1 Location of Study Area 8

2 Scatter Diagram, Regressions, and Correlations for Pine (A,B,C) and Aspen/Sand (D,E,F) Series ... 23

3 Scatter Diagram, Regressions, and Correlations for Black Spruce/Organic (A,B) and Aspen/Clay loam Series (C,D,E) 24

4 The Vertical and Partial Horizontal Root System of (A), Black Spruce; (B), Larch; (C), White Spruce; and (D), Aspen 48

5 The Vertical and Partial Horizontal Root System of (A), Jack Pine; and (B), Balsam Fir 57

6 A Coleman Block Calibration Curve for Converting Electrical Resistance to Soil Matrix Potential ... 77

7 An Example of a Diurnal Curve (A) and Corrected and Uncorrected Plant Water Potentials (B) 86

8 Summer Plant Water and Soil Matrix Potential (-MPa) for Plot 1 (A) and Plot 2 (B) of the Jack Pine/Sand Series............................... 86

9 Summer Plant Water and Soil Matrix Potential (-MPa) for Plot 3 (A) and Plot 4 (B) of the Jack Pine/Sand Series 87

10 Summer Plant Water and Soil Matrix Potential (-MPa) for Plot 7 (A) and Plot 8 (B) of the Black

Spruce/Organic Series 88
11 Summer Plant Water and Soil Matrix Potential (-MPa) for Plot 11 (A), Plot 5 (B), and Plot 6 (C) of the Aspen/Clay Loam Series 89
12 Summer Plant Water and Soil Matrix Potential (-MPa) for Plot 10 (A) and Plot 9 (B) of the (-MPa) Aspen/Sand Series 91
13 Summary of Minimum Plant Water Potentials and Maximum Observed Rooting Depths by Series 98
14 PCA and Product-moment Correlation Analysis of Soil Properties by Successional Group.......... 137

CHAPTER I

INTRODUCTION

Northern Alberta is predominantly a forested landscape which can be divided into several ecologically distinct units. The largest unit is the Boreal Mixedwood Ecoregion (Strong and Leggat 1981), which composes 40% of the land area in the province. Boreal Mixedwood vegetation extends from the eastern edge of British Columbia to the southwestern corner of Manitoba; however, the greatest areal extent occurs in Alberta (Rowe 1972).

Published accounts of research on the vegetation ecology of this area are limited, despite its vast size. Work by Halliday and Brown (1943), Moss (1953a,b; 1955), and Rowe (1956) were the most comprehensive studies available prior to the 1960's. During the last decade, as a response to resource development activities, research interests have increased in the Boreal Mixedwood area. This work has been primarily concentrated in the agricultural fringe (e.g., Alberta Energy and Natural Resource ecological inventories), tar sands (Stringer 1976, Peterson and Levinsohn 1977, Hardy and Associates 1978), and Peace-Athabasca Delta areas (Dirschl, Dabbs and Gentle 1972). Unfortunately, much of this ecological work has an inventory orientation.

Vegetation ecology usually employs a variety of traditional plant and soil sampling techniques in combination with synthetic methods such as ordination. From these data interpretations are made regarding the relationship between plants and their below-ground environment. Such an approach assumes homogeneity in substrate and biological response, i.e. vertical variations in root distributions and soil conditions are overlooked. It is difficult from this approach to determine which edaphic factors plants are responding. If the distribution of roots was known, a more comprehensive interpretation of plant/edaphic relationships could be made. Without this information a more complete understanding of boreal forest ecosystems will be tenuous.

The existing literature does not indicate precisely where, in the soil, boreal plant communities obtain moisture and nutrients *via* roots. Also, it is not known whether understory plants utilize the same or different soil horizons as trees, nor have any studies been found which deal directly with forest community rooting. Historically, forest root studies have dealt with the habits and patterns of trees (e.g., Cheyney 1929, 1932; Bannan 1940; LeBarron 1945; Horton 1958; Jeffrey 1959; Yeatman 1955; Eis 1970, 1974, 1978). More recent studies have taken a more analytical approach to these studies. For instance, Keyes and Grier (1982) compared the above- and below-ground productivity, of *Pseudotsuga menziesii* relative to site capability, while St. John (1983) experimentally tested the concept of "nutrient tropism" by roots. Although most ecological root studies have dealt with trees, some research has been directed towards understory species (e.g., Cheyney 1928; Berndt and Gibbons 1958; Holloway and Zasada. 1979; Calmes and Zasada 1982).

Three hypotheses were developed during the early stages of this research as basis for testing the relationship between plant community development and root distributions:

Hypothesis 1 - *The root distribution pattern of boreal forest communities is correlated with seral stage as based on stand age.*

Hypothesis 2 - *The distribution and development of upland forest communities is primarily correlated with soil moisture availability.*

Hypothesis 3 -*Boreal Mixedwood understory plants primarily extract soil moisture from the upper (e.g., 60 cm) portion of the rooting zone on both organic and minerals soils.*

In addition to testing the stated hypotheses, the general aim of this dissertation is to determine the relationship between root systems and their below-ground environment; and more specifically to (i) determine the relationships between plant community rooting depth and stand age, (ii) determine the general rooting pattern of several common boreal forest tree species under different site conditions and the potential importance of these rooting patterns in community development, (iii) determine the relationships between root distribution, soil moisture, and plant water potentials, and (iv) determine the relationships between root distribution and soil nutrients and other edaphic conditions. These relationships will be interpreted for their significance in boreal forest community ecology as well as in succession. Furthermore, the data from this work will be used to generate new hypotheses about the role of below-ground components of vascular plants in boreal ecosystems.

CHAPTER II

ROOTING DEPTHS AND SUCCESSIONAL DEVELOPMENT OF SELECTED BOREAL FOREST COMMUNITIES[1]

ABSTRACT [2]

The root density and depth patterns of four boreal forest age sequences were analyzed for successional trends. Rooting depths increased with age on sandy substrates which supported aspen (*Populus tremuloides* Michx.) and jack pine (*Pinus banksiana* Lamb.) communities. Rooting depth did not change in an aspen series on fine-textured substrates or in a black spruce (*Picea mariana* (Mill.) BSP.) series growing on organic substrates. Plant communities growing on mineral soils showed a decrease in near-surface root densities and understory vascular plant cover with increasing age.

Maximum rooting was deepest on sandy substrates and shallowest on organic deposits. Roots in all stands were concentrated near the ground surface. In most cases 50 percent of all roots were located within 15 cm of the forest floor. Root densities in this zone ranged from 11,000 to 30,000 roots m^{-2} of vertical surface. Densities were approximately 4,300 roots m^{-2} for the overall rooting zone.

---

[1] Reproduced by permission of the National Research Council of Canada from Canadian Journal of Forest Research, Volume 13, 1983. pp. 577-588.
[2] [ ] represent additions to the text relative to the published version.

INTRODUCTION

Synecological studies are concerned with the relationship between plant communities and their environments. Typically, species and edaphic data are collected separately during field sampling. Edaphic data such as parent material, drainage, topographic, and soil characteristics are interpreted to elucidate plant-edaphic relationships. However, the plant-edaphic interface is seldom examined in natural communities and it is commonly assumed that plants respond to the overall conditions of the site. If this interface was studied, plant rooting systems would be the logical starting point because they integrate vascular plants into the subterrestrial environment.

Historically, most studies dealing with rooting habits and patterns have been autecologically oriented (e.g., Cheyney 1928, 1932; Bannan 1940; Wagg 1967; Eis 1970, 1974; Keyes and Grier 1981; Vogt *et al*. 1982), conducted in grassland environments (e.g., Coupland and Johnson 1965; Weaver 1968), and/or related to agricultural crops (e.g., Gist and Smith 1948). In particular, rooting studies have been largely neglected in ecological studies of boreal forest communities. Without rooting studies, postulated relationships between plant communities and their environments cannot be rigorously tested.

The objectives of this paper are to (1) describe the root distribution patterns of 11 boreal forest stands in terms of depth and density, and (2) relate rooting depth to successional development. Future reports by the authors will involve a more detailed consideration of roots and their edaphic environment. Hopefully, this research will stimulate further work on the subterrestrial relationships of boreal ecosystems.

Herein, "root" is broadly defined to include true morphological roots, rhizomes and other below-ground conduction, support, and storage structures. This broad definition was necessary due to the difficulty of separating and identifying species by their below-ground root structures.

STUDY AREA

The study area is located in central Alberta approximately 175 km north of Edmonton and 55 km southeast of Lesser Slave Lake (Figure 1). As mapped by Strong and Leggat (1981), the area occurs within the Boreal Mixedwood Ecoregion. This climatic region is characterized by a maximum mean monthly temperature of 15.7°C in July and a minimum of -18.7°C in January based on the Slave Lake meteorological station (Anonymous 1982b). Precipitation

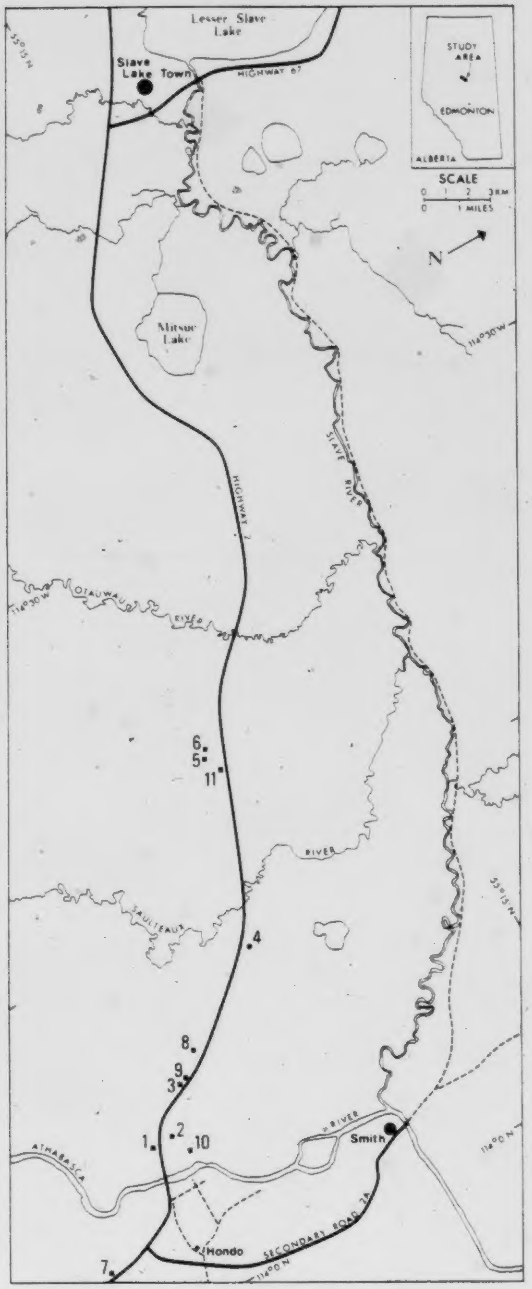

Lesser Slave Lake
Slave Lake Town
HIGHWAY 67
55°15'N
STUDY AREA
EDMONTON
ALBERTA
SCALE
0 1 2 3 KM
0 1 MILES
N
114°30'W
Mitsue Lake
SLAVE RIVER
HIGHWAY 2
114°30'W
OTAUWAU RIVER
6
5
11
RIVER
SAULTEAUX
55°15'N
4
8
9
3
1
2
10
RIVER
Smith
ATHABASCA
114°0'N
Hondo
SECONDARY ROAD 2A
114°0'N
7

Figure 1. Location of Study Area.

averages 475 mm per year with peak rainfall in July. This boreal climate is classified as Dfc (Subarctic, microthermal, humid, snow forest) under the Koeppen climatic classification system (Critchfield 1966). La Roi and Ostafichuk (1984) should be consulted for a more detailed review of macro-climatic conditions in the study area.

Moderately well-drained, medium-textured soils of the Boreal Mixedwood climatic regime support forest vegetation dominated by aspen (*Populus tremuloides* Michx.), balsam poplar (*P. balsamifera* L.), and white spruce (*Picea glauca* (Moench) Voss).[3] The abundance of the latter species is strongly influenced by local fire history and seed availability. Gray Luvisolic soils typically develop beneath this type of boreal vegetation.[4] Submesic sites support aspen communities with a small jack pine (*Pinus banksiana* Lamb.) component and soils of the Eutric Brunisol Great Group. Xeric sites are dominated by jack pine stands. Soils are sandy and Eutric Brunisols. Poor to very poorly drained sites are dominated by black spruce (*Picea mariana* (Mill.) BSP.) with scattered larch (*Larix laricina* (Du Roi) K. Kock). Such sites occur in topographic depressions where the water table occurs within a few dm of the ground surface. Most black spruce sites have poorly aerated soils formed from the accumulation of organic debris that is >50 cm thick. Organic and Gleysolic soils predominate under these conditions. Strong and La Roi (1984) should be consulted for a more comprehensive description of soils.

---

[3] Vascular plant taxonomy follows Moss (1959).
[4] Soil taxonomy follows that developed by the Canada Soil Survey Committee (Anonymous 1978).

The topography is gently rolling throughout the area. Stabilized late-glacial aeolian deposits in the form of rolling plains and sand dunes dominate the southern sector of the study area, while shallow outwash (20-30 cm) overlies medium-textured morainal deposits in the northern sector.

Post-establishment perturbations appear to have been minimal within the stands under study. However, influences from herbivores, fire, and human activities are common in the study area. Fire has influenced both the age structure and species composition of the present vegetation. The most recent fires were during the early 1940's.

All except one of the eleven stands selected for study appear to have originated after significant fires; Stand 11 developed on the edge of a highway borrow pit which was stripped of vegetation approximately 22 years ago, possibly by bulldozers. Examination of its soil profile suggested that disturbance was limited to the vegetation and surface litter layers.

METHODS

The eleven forest stands selected for study are thought to represent different developmental stages along four successional sequences (seres), but the relationship between stand age and degree of development may not necessarily be proportional. Table 1 summarizes selected characteristics of each site.

Stands were sampled with nested quadrats. Tree cover and composition were estimated from a 20x50 m macroplot. Understory vegetation was estimated from seven randomly selected 5x5 m subplots from the 20 available in each gridded macroplot. The species composition, cover, and stratification of the understory vegetation >0.3 m in height was tallied from each subplot. Cover estimates were made for species <0.3 m in height in a 2x2 m quadrat placed in the center of each subplot. The vegetation data given in Table 2 are averages from the seven subplots. All samples were taken during the main growing season, late June through early August of 1981 or 1982.

A soil pit was dug in the center of each of the seven subplots to a minimum depth of 1.25 m. Due to a high water table in Stands 7 and 8, it was necessary to remove intact sections of soil profiles from the pits rather than attempt to work in the hole as was done in other stands. Each pit

Table 1. Stand age and selected site conditions.

Plot	Age (yrs.)	Parent Materials	Drainage Class	Average Percent Slope	Soil Great Group
JACK PINE/SAND SERIES[a]					
1	40	Aeolian	Well	6[b]	Eutric Brunisol
2	60	Aeolian	Well	4	Eutric Brunisol
3	85	Aeolian	Well	5	Eutric Brunisol
ASPEN/SAND SERIES					
10	48	Aeolian	Well	6	Eutric Brunisol
9	79	Aeolian	Well	7	Eutric Brunisol
4	170	Aeolian	Well	5	Eutric Brunisol, Gray Luvisol
ASPEN/CLAY LOAM SERIES					
11	19	Outwash/moraine	Moderately-well	3	Gray Luvisol
5	72	Outwash/moraine	Moderately-well	3	Gray Luvisol
6	115	Outwash/moraine	Moderately-well	3	Gray Luvisol
BLACK SPRUCE/ORGANIC SERIES					
7	55	Organic/aeolian	Very Poorly	1	Terric Mesisol
8	122	Organic/aeolian	Poor to Very Poorly	1	Humic Gleysol, Terric Humisol

---

[a] Stand 4 used in both the Pine- and Aspen/sand Series.
[b] Measurements made with a clinometer.

was pedologically described and classified. After excavation one face of the pit was smoothed with a knife and washed with a low-pressure water sprayer. This technique exposed root ends which allowed easier counting. Root counting was facilitated by the use of a 1.25x0.2 m counting frame composed of a matrix of 200 cells, each 2.5x5 cm. This sampling design is similar to that described by Bohm (1979), except individual cells were half as deep, permitting greater vertical definition. By placing the counting matrix vertically against the pit face, it was possible to determine the number of roots in each row of cells as the soil profile was descended.

RESULTS

Stand Description

Four stands (1,2,3,4) were recognized as members of a jack pine successional sequence on sand. These stands ranged from 40 to 170 years in age. The younger stands (1 and 2) were characterized by an open-canopied jack pine forest and an understory dominated by *Arctostaphylos uva-ursi* (L.) Spreng. and *Cladina mitis* (Sandst.) Hale & Culb. (Table 2).[5] Trees were uneven-aged and had a clumped

---

[5] Lichen taxonomy follows Bird (1970) and bryophyte taxonomy follows Ireland *et al.* (1980).

Table 2. Vegetation composition, cover classes[a], and floristic characteristics based on species with a >50 percent frequency by plot.

	Jack Pine/ Sand			Aspen/ Sand			Aspen/ Clay Loam			Black Spruce/ Organics	
PLOT NUMBER	1	2	3	10	9	4	11	5	6	7	8
OVERSTORY SPECIES											
Abies balsamea (L.) Mill.	-	-	-	-	-	4	-	-	-	-	-
Picea glauca (Moench) Voss	-	-	-	-	-	4	-	5	4	-	-
Picea mariana (Mill.) BSP.	-	-	-	-	-	-	-	-	-	2	4
Pinus banksiana Lamb.	4	4	5	-	-	-	-	-	-	-	-
Populus balsamifera L.	-	-	-	-	-	-	1	-	-	-	-
Populus tremuloides Michx.	-	-	-	6	5	-	5	5	2	-	-
UNDERSTORY SPECIES											
Abies balsamea (L.) Mill.	-	-	-	-	-	3	-	-	-	-	-
Actaea rubra (Ait.) Willd.	-	-	-	-	-	-	-	-	1	-	
Alnus crispa (Ait.) Pursh	-	-	5	4	3	-	-	-	-	-	-
Amelanchier alnifolia Nutt.	1	1	-	1	1	-	-	-	-	-	-
Andromeda polifolia L.	-	-	-	-	-	-	-	-	-	1	-
Aralia nudicaulis L.	-	-	2	4	2	-	4	3	4	-	-
Arctostaphylos uva-ursi (L.) Spreng.	2	4	1	-	-	-	-	-	-	-	-
Aster ciliolatus Lindl.	-	-	-	-	-	-	-	1	r	-	-
Aster conspicuus Lindl.	-	-	-	-	-	-	2	1	r	-	-

Table 2. *Continued.*

PLOT NUMBER	1	2	3	10	9	4	11	5	6	7	8
Betula glandulifera (Regel) Butler	-	-	-	-	-	-	-	-	-	2	-
Calamagrostis canadensis (Michx.) Beauv.	-	-	-	1	2	-	4	1	2	r	-
Carex diandra Schrank	-	-	-	-	-	-	-	-	-	2	-
Carex gynocrates Wormsk.	-	-	-	-	-	-	-	-	-	3	-
Carex spp.	-	-	-	-	-	-	-	-	-	2	-
Cornus canadensis L.	-	-	-	2	3	r	2	1	2	-	-
Elymus innovatus Beal	1	1	r	1	1	r	2	-	-	-	-
Epilobium angustifolium L.	-	-	-	1	1	-	2	-	1	-	-
Galium boreale L.	r	r	-	r	1	r	r	-	1	-	-
Lathyrus ochroleucus Hook.	-	-	-	-	-	-	1	-	r	-	-
Ledum groenlandicum Oeder	-	-	-	-	-	-	-	-	-	3	4
Linnaea borealis L.	-	-	2	2	2	r	-	-	1	-	-
Lonicera involucrata (Richards.) Banks	-	-	-	-	-	-	r	1	3	-	-
Maianthemum canadense Desf.	1	1	1	1	2	-	1	1	1	-	-
Menyanthes trifoliata L.	-	-	-	-	-	-	-	-	-	1	-
Mertensia paniculata (Ait.) G. Don	-	-	-	-	-	-	1	1	1	-	-
Mitella nuda L.	-	-	-	-	-	-	-	1	1	-	-
Oryzopsis pungens (Torr.) Hitchc.	1	2	-	-	-	-	-	-	-	-	-
Petasites palmatus (Ait.) A. Gray	-	-	-	-	-	-	1	1	1	-	-
Picea glauca (Moench) Voss	-	-	-	-	-	-	-	1	-	-	-

Table 2. *Continued.*

PLOT NUMBER	1	2	3	10	9	4	11	5	6	7	8
Picea mariana (Mill.) BSP.	-	-	-	-	-	-	-	-	-	3	3
Pinus banksiana Lamb.	1	1	-	-	-	-	-	-	-	-	-
Populus tremuloides Michx.	-	-	-	2	-	-	2	-	-	-	-
Potentilla palustris (L.) Scop.	-	-	-	-	-	-	-	-	-	1	-
Prunus pensylvanica L.f.	-	-	-	3	2	-	-	-	-	-	-
Pyrola asarifolia Michx.	-	-	-	1	1	-	1	1	1	-	-
Rosa acicularis Lindl.	-	1	2	2	2	-	2	1	3	-	-
Rubus pubescens Raf.	-	-	-	3	1	-	4	1	2	-	-
Rubus strigosus Michx.	-	-	1	2	1	-	-	-	r	-	-
Salix pedicellaris Pursh.	-	-	-	-	-	-	-	-	-	1	-
Smilacina trifolia (L.) Desf.	-	-	-	-	-	-	-	-	-	1	-
Vaccinium myrtilloides Michx.	-	1	1	1	1	-	-	-	-	-	-
Vaccinium vitis-idaea L.	2	3	1	1	-	-	-	-	-	-	r
Viburnum edule (Michx.) Raf.	-	-	-	2	2	1	3	2	4	-	-
Vicia americana Muhl.	-	-	-	-	-	-	1	-	-	-	-
BRYOPHYTES AND LICHENS											
Aulacomnium palustre (Hedw.) Schwaegr.	-	-	-	-	-	-	-	-	-	4	-
Brachythecium campestre (C. Mull.) B.S.G.	-	-	-	r	1	-	1	1	-	-	-
Cladina mitis (Sandst.) Hale & Culb.	5	5	-	-	-	-	-	-	-	-	1

Table 2. *Concluded.*

PLOT NUMBER	1	2	3	10	9	4	11	5	6	7	8
Cladonia spp.	1	1	-	-	-	-	-	-	-	-	-
Eurhynchium pulchellum (Hedw.) Jenn.	-	-	-	-	-	-	-	-	2	-	-
Hylocomium splendens (Hedw.) B.S.G.	-	-	-	-	-	5	-	-	2	-	3
Peltigera spp.	-	1	-	-	-	1	-	-	-	-	1
Pleurozium schreberi (Brid.) Mitt.	-	-	6	-	-	3	-	1	4	-	6
Sphagnum nemoreum Scop.	-	-	-	-	-	-	-	-	-	-	1
Tomenthypnum nitens (Hedw.) Loesek	-	-	-	-	-	-	-	-	-	4	-
FLORISTIC CHARACTERISTICS[b]											
Species Richness (R)	29	26	24	25	35	23	38	28	36	41	20
Dominance Index (D)	.27	.18	.24	.20	.15	.21	.14	.21	.09	.12	.28
Diversity Index (H')	.74	.92	.76	.91	1.08	.79	1.05	.89	1.16	1.09	.65

---

[a] COVER CLASSES r=<1%, 1=1-5%, 2=6-15%, 3=16-25%, 4=26-50%, 5=51-75%, 6=76-95%.

[b] Based on Whittaker (1976).

distribution. These two stands were similar in composition and were not distinctly different except in terms of age. Stand 3 of this series had a more evenly distributed tree stratum than those of Stands 1 and 2. *Alnus crispa* (Ait.) Pursh and *Pleurozium schreberi* (Brid.) Mitt. dominated the understory. Stand 4 represents a plant community in the late (i.e. subclimax) stage of succession, with balsam fir and white spruce co-dominating the multi-layered overstory. Mosses constituted 80% of the total understory vegetation cover, with balsam fir the main component of the remaining 20% cover. Based on tree ring counts, this stand appears to have originated around 1810. During its early stages of development the stand appears to have been co-dominated by aspen and jack pine. However, it is not clear which species had the greater cover because most specimens of the original stand have long since disappeared. Scattered remnants can be found of both species, but jack pine is more abundant at present. This may be in part explained by its somewhat longer life expectancy (Harlow and Harrar 1968) and better health. A comparison of understory floristics suggests that Stand 4 is at present more closely aligned with the Aspen/Sand than the Jack Pine series. Stand 4 could represent a convergent, late successional product of both series due to the similarities of site conditions. For these reasons Stand 4 is considered a member of both the aspen and pine series on sand.

Three stands (10,9,4) composed the aspen successional sequence on sand. Aspen dominated the vegetation of Stands 9 and 10, and formed closed-canopy forests. These stands ranged from 40 to 170 years in age. Subdominant white spruce occurred sporadically throughout Stand 9, but only in the tall herb layer (0.1-0.3 m) of the younger aspen stand (10). The understory vegetation was more diverse than that found in the Jack Pine series (Table 2). Herbaceous species were more abundant and shrubs such as *Prunus pensylvanica* L.f., *Amelanchier alnifolia* Nutt., and *Rosa acicularis* Lindl. were >1 m tall. In the Jack Pine series these shrubs were dwarfed.

The aspen and pine sequences developed on sandy-textured aeolian deposits (>2 m deep) which overlay beach deposits of a glacial lake (St. Onge 1972). Soils were Orthic and Eluviated Eutric Brunisols, except in Stand 4, where they graded from Eluviated Eutric Brunisols to Brunisolic Gray Luvisols. All six sites were considered well-drained as defined by the National Soil Survey Committee (Anonymous 1974).

Aspen communities were more common on fine-textured substrates than on sand. Three stands (11,5,6) were found that represent a successional sequence from closed-canopied aspen (Stand 11) to aspen with a subdominant white spruce stratum (Stand 5) to open-canopy white spruce with remnant aspen (Stand 6). These stands ranged in age from 19 to 115 years. Stand 11 had an understory species composition dominated by herbs such as *Calamagrostis canadensis* (Michx.) Beauv., *Aralia nudicaulis* L., and *Rubus pubescens* Raf. (Table 2). The understory vegetation of Stand 5 was less diverse than Stand 11. However, diversity was higher in Stand 6 as canopy openings were created by the toppling of decadent aspen and occasional white spruce. Evergreen vascular species and mosses were much more abundant in Stand 6 than in the other two stands.

The parent materials of these three sites were complex due to erosion by glacial meltwaters and subsequent deposition of sandy loams over the pre-existing sandy clay loam moraine deposits. Numerous cobbles occurred between the two deposits. Outwash deposits averaged approximately 20 cm thick on the three sites. Soil classification and analysis were difficult, due to the heterogeneity of the parent materials. Orthic and Gleyed Gray Luvisols were most common on these sites.

Stands 7 and 8 were black spruce communities that occurred in poorly drained inter-dunal depressions. As a result of the impeded drainage, these depressions had organic accumulations of varying thickness and degree of decomposition.

Stand 7 was both floristically and topographically diverse. Black spruce was the dominant tree species, although it seldom exceeded eight meters in height. *Carex* spp. and mosses composed the majority of the understory vegetation cover. Numerous species with low cover contributed to the relatively high diversity of this stand. Topographic diversity occurred in the form of alternating hummocks and hollows. The water table was within 10-30 cm of the ground surface in the depressional areas throughout most of the year. Soils were Terric Mesisols which had an organic accumulation of approximately 190 cm.

Stand 8 was markedly different from 7. The vegetation was appproximately 120 years old and at a late successional stage. While black spruce formed the overstory, *Ledum groenlandicum* Oeder and a carpet of *Pleurozium schreberi* dominated the understory. The soils associated with this site were classified as Terric Humisols and Orthic Gleysols. The organic debris accumulation ranged from 25 to 75 cm. Water was commonly within 20 cm of the ground surface during most of the year; however, fluctuations in this water level may be greater than those of Stand 7. Both Stand 7 and 8 had fibric soil surface horizons (10-20 cm) and occurred above mesic horizons. The mesic horizons of Stand 8 ranged upto 40 cm, but averaged 20 cm in thickness, whereas they exceeded 1.5 m in Stand 7. The greater degree of organic decomposition may be a result of the water level fluctuations and increased aeration.

Root Depths and Densities

The litter/mineral soil interface was used as the datum for correlating the pits within each macroplot. In the organic soils of Stand 7 and 8 the lower boundary of the living green moss layer was the datum. To facilitate the analysis of root data, corresponding rows of root densities from subplots were aggregated and averaged to determine mean root density per depth increment (i.e. density per row of the counting frame). Aggregated root counts were transformed to base 10 logs. These mean root densities were then statistically correlated and regressed against depth(Figures 2 and 3).

All stands showed a highly significant ($P < 0.01$) decrease in root density with increasing depth. Maximum rooting depth was found on coarse-textured soils; minimum rooting depth was on organic soils. Important residual variations occur in most of the scatter diagrams presented in Figures 2 and 3. These residuals were most prominent in the upper and lower portions of the soil profiles. Approximately 50 percent of all roots were located within the upper 7 to 19 cm of the rooting zone (Table 3). Average root densities ranged from 11,000 to 30,000 roots m^{-2} within the upper 10 cm of the rooting zone; the average overall

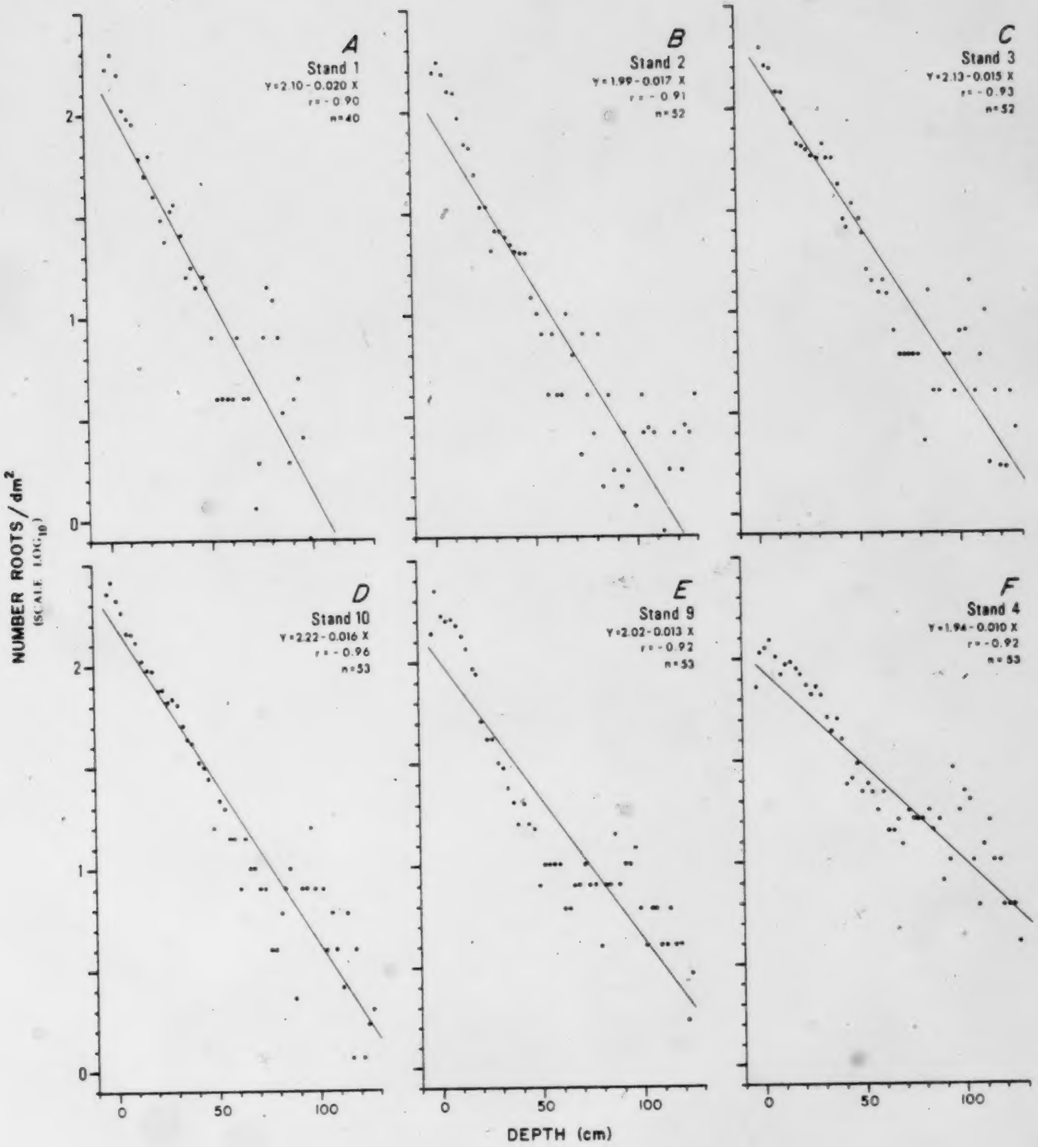


Figure 2. Scatter Diagram, Regressions, and Correlations for Pine (A,B,C) and Aspen/Sand (D,E,F) Series. [Xero depth represents LFH/A horizon interface.]

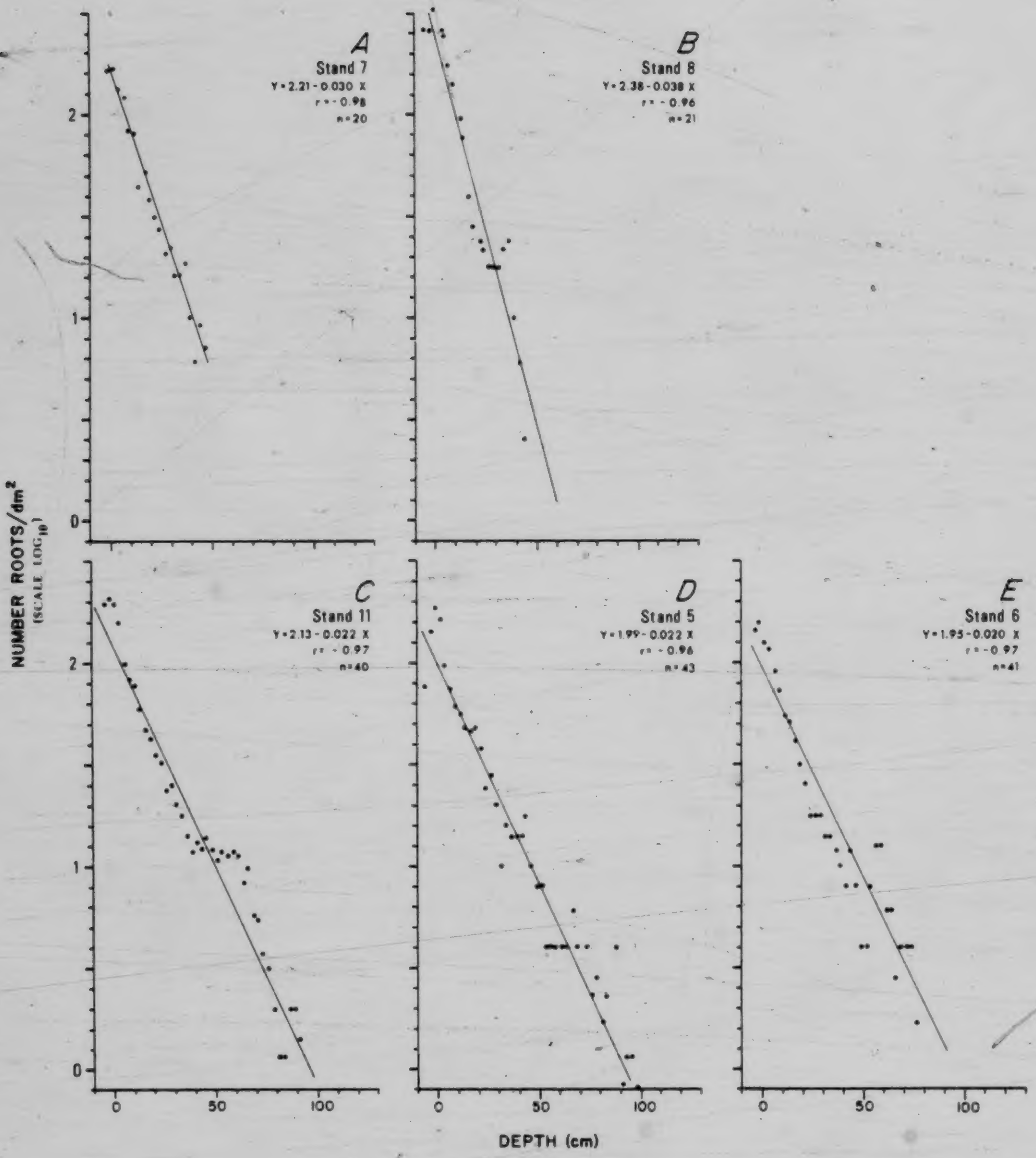


Figure 3. Scatter Diagram, Regressions, and Correlations for Black Spruce/Organic (A,B) and Aspen/Clay Loam Series (C,D,E). [Xero depth in Black Spruce Series represents "green/brown" moss interface, whereas it represents the LFH/A horizon interface in the Aspen Series.]

Table 3. Root densities in 11 boreal forest stands of the Hondo-Lesser Slave Lake area in central Alberta, based on measurements in seven pits per stand.

Series Stand	Depth to Median Root Density (cm)[a]	Number of Roots [in] Upper 10 cm (m^{-2})	Number of Roots per Rooting Zone (m^{-2})
JACK PINE/SAND[b]			
	**	**	ns
1	11.4[c]	16,321[c]	4,810
2	12.6[c]	15,228[c]	5,375
3	18.3[d]	14,657[c]	4,964
4	23.5[e]	11,042[d]	3,865
ASPEN/SAND			
	**	**	ns
10	15.4[c]	20,921[c]	5,499
9	13.8[c]	17,428[c]	4,135
4	23.5[d]	11,042[d]	3,865
ASPEN/CLAY LOAM			
	ns	ns	ns
11	11.0	17,971	4,121
5	11.6	15,314	3,993
6	10.6	14,307	3,407

Table 3. *Concluded.*

Series Stand	Depth to Median Root Density (cm)	Number of Roots [in] Upper 10 cm (m^{-2})	Number of Roots per Rooting Zone (m^{-2})
BLACK SPRUCE/ORGANIC			
	ns	**	**
7	8.1	15,171	6,398
8	7.9	30,114	12,023

---

[a] Half of root density occurs above and below depth indicated, as measured from the top of the rooting zone.

[b] Analysis of Variance indicate which series have significantly different values (depth to median density, etc.) among stands; '**' is P<0.01, "ns" is not significant at P<0.05 level.

[c,d,e] Stands having same superscript within each category are not significantly different at the P<0.05 level based on Duncan's Multiple-range test (Steel and Torrie 1960, p. 107-109).

root density was approximately 1/2 to 1/4 that of the surface zone. Maximum root concentrations occurred in the LFH horizons with the greatest at the datum, organic/mineral soil, interface in most profiles (Figures 2 and 3). Densities ranged from 8,800 to 25,600 roots m^{-2} in the interface area.

Stand 8 had the highest and Stand 4 had the lowest surface root density of the four series. Aspen/Sand stands had the highest overall and surface root densities of the communities on mineral soil. Young stands had higher surface root densities than older stands of the same series with the exception of the Black Spruce series, where the opposite trend prevailed.

Coarse roots (>5 mm) were usually restricted to the upper 10 cm of the rooting zone. Fine roots were more widely distributed throughout the rooting zone, but they too were more numerous in the upper 10 cm.

The Jack Pine series showed an increase in rooting depth with increasing stand age. Such increases in depth were evident from a decrease in regression line slope with increasing stand age. Furthermore, an increase in depth to median root density provided additional evidence for an increase in rooting depth with increasing age (Tables 3 and 4). No major vertical discontinuities were evident within the rooting zone (Figures 2a,b,c). Samples, however, were

Table 4. Comparison of regression slope angles and intercepts of the root density-depth relations of 11 boreal forest stands of the Hondo-Lesser Slave Lake area in central Alberta, using the GT2-method and [Student's] t-test. See also Figures 2 and 3.

JACK PINE/SAND SERIES[a]

Stand	2	3	4
1	0.0082**[b]	0.0045**	0.0099**
2	-	0.0015[c]	0.0069**
3	-	-	0.0054**

ASPEN/SAND SERIES

Stand	9	4
10	0.0020**	0.0064**
9	-	0.0044**

ASPEN/CLAY LOAM SERIES

Stand	5	6
11	0.0004	0.0018
5	-	0.0014

BLACK SPRUCE/ORGANIC SERIES

Stand	8
7	11.67**

---

[a] GT2-method [(Sokal and Rohlf 1981)] used for aspen and jack pine series.

[b] ** - Significantly different slope angles at the $P<0.01$ level.

[c] The y-intercepts of Stands 2 and 3 are significantly different at the $P<0.01$ level based on t-test.

more dispersed around the regression line in the lower than in the upper portion of the rooting zone. Stand 3 had higher root densities throughout the rooting zone and a greater rooting depth than Stands 1 or 2. Stand 4 had the maximum rooting depth, but had 10 to 40% lower rooting density within the upper 40 to 45 cm of the rooting zone compared with the other three stands.

Rooting depth increased with age in the aspen/sand series. However, near-surface root density decreased with increasing stand age. Maximum root density, 20,921 roots m^{-2} in Stand 10, occurred at the mineral/organic interface of the soil (Table 3). Roots extended to a maximum depth of approximately 130 cm in both the aspen and jack pine series on sand (Figures 2d,e,f). Samples in Stand 10 closely approximate the regression line, except in the lower portion. Stand 9 samples were more asymmetrically dispersed about the regression line than those of Stands 10 or 4.

Aspen Stands 11, 5, and 6 on clay loam did not show a trend of increasing rooting depth with age (Figure 3c,d,e). Although Stand 6 was approximately 96 years older than Stand 11, their regression lines were almost identical (Table 4). Stand 6 had a lower overall root density than Stand 11 or 5, but this difference was not statistically significant. Also, root density was higher in the middle portion (40-60 cm) of the soil profile (Figure 3c) in Stand 11. This discontinuity includes the lower boundary of the Bt horizon and the upper 20 cm of the C horizon. The Bt horizon had a granular structure, whereas the C horizon was massive. Both horizons were similar in bulk density and particle sizes. Although near-surface root density consistently decreased with increasing stand age, the former was not significantly different between stands (Table 3). Maximum rooting depth was approximately 95 cm.

The scatter diagrams for Stands 7 and 8 differ from those of the other stands (Figures 2 and 3). Plants growing on these sites are more shallow-rooted with a distinctive lower boundary at 45 and 60 cm, respectively. Stands 7 and 8 showed an increase in surface and overall root density with increasing age. Black spruce and to a lesser extent *Ledum groenlandicum* were the main plant constituents of the rooting zone in Stand 8.

DISCUSSION

Succession

Indirect studies of succession using contemporaneous stands with similar site conditions but different ages have advantages and disadvantages compared with direct, long-term studies in permanent plots (Barbour *et al.* 1981). In the study area, the two most important questions are whether the stands have the same developmental history and whether they have the same site conditions.

The first question is most evident in the jack pine series. Stand 3 appears to be successionally more advanced than its age (85 yrs.) would suggest. This advanced state may be related to stand establishment history (e.g., density, age, and seed production of the stand that preceded it). A higher initial seedling density could have shortened the tree establishment stage, which is still ongoing in Stand 1 and 2, and accelerated the rate of succession relative to chronological stand age.

The second question centers on the possibility that Stands 7 and 8 do not belong to the same successional series due to differences in hydrologic regime. For example, the soils of Stand 7 are classified differently and have a deeper accumulation of organic material than those of Stand 8. However, both sites are influenced by a high water table and have surface substrates composed of fibric to mesic organic materials. The substrates may vary in chemical composition, but these differences likely develop as a result of species replacement and aggrading site conditions during succession. Despite the potential differences in site conditions, both stands were rooted within the upper 15 cm of the ground surface, above the water table.

Furthermore, Stand 8 may represent a subclimax or climax community type capable of occupying a variety of wetland sites that have been modified by hydrarch succession. Further research will be required to evaluate the successional status and hydrologic regime of Stands 7 and 8.

Rooting Systems

If the four time and vegetation/substrate series do in fact represent successional sequences, then dynamic changes are evident both below- and above-ground. Autogenic above-ground changes occur as species composition and abundance change over time. Such changes may be reflected by changes in root density and the growth of roots to greater depth (Table 4). For example, the Aspen/Sand series shows a [corresponding] decrease in surface root density and understory herb cover (Table 2 and 3). Such understory decreases probably result from decreasing light intensity and soil temperatures during the advanced aggrading stage (Bormann and Likens 1979) of succession, when the overstory canopy becomes saturated with white spruce and balsam fir. The increased rooting depth as illustrated by the Aspen/Sand and Pine series may be the result of deep-rooted climax species replacing more shallow-rooted seral species. This hypothesis is reinforced by theoretical work of Berendse (1979), field studies of *Typha* by Grace and Wetzel (1982), and old field succession studies by Parrish and Bazzaz (1976, 1982). occurs in the Hubbard Brook Experimental Forest. Why rooting depth would increase with age is open to debate. Geotropism, hydrotropism, chemotropism, resource partitioning, increasing resource requirements, and avoidance of biotic interaction may be important factors. However, further research is required to evaluate the relative importance of these factors.

Although it is difficult to place much credence in a series composed of only two samples, an increase in root density with age was suggested by the Black Spruce series. This increase occurred despite the reduction in species diversity (Table 2) and may have caused it. The relatively high species diversity of Stand 7 was probably a result of several factors, but diverse microtopography in the form of hummocks and depressions, open tree canopy, and recent fire history seem most important. These factors became less varied with the development of Stand 8. The above-ground development of the two stands paralleled below-ground increases in surface and overall root densities. The observed root pattern in Stand 8 is almost exclusively that of black spruce as it is overwhelmingly the dominant vascular species in the stand.

Not all mineral soil series show an increase in rooting depth with increasing age. The aspen stands on clay loam

(11,5,6) reached maximum rooting depth in less than 20 years. This could be related to a restricted rooting zone, created by the fine-textured morainal subsoil. It seems more likely, however, that maximum rooting depth is attained at an early age because of rapid regeneration from established below-ground structures that survived the disturbance (fire). Aspen is well known for this adaptation. Consequently, maximum rooting depth appears to remain relatively stable throughout the series.

However, total root density in the Aspen/Clay Loam series appears to decrease with increasing age, probably due to a decline in near-surface root density (Table 3). This decrease may be a result of increased moss and conifer cover, and decreased aspen and herb cover. Both of the latter [plant groups] appear to have a denser rooting pattern than late-successional vegetation.

Mosses may contribute to lower surface rooting densities by reducing nutrient and water flow to the mineral soil, by adversely affecting soil microclimate, and/or by allelochemical inhibition of root growth. An example of this was evident in Stand 3, a pine/feathermoss forest. Here, a thick moss carpet (10-15 cm) has developed over a pre-existing pine root system which probably developed in a lichen woodland environment similar to those of Stands 1 and 2. The establishment of this moss carpet may have resulted in the death of shallow pine roots and development of a second system of pine roots approximately 20 cm below the first system. The first root system has degenerated and been replaced by the second. Mosses could have caused this phenomenon by intercepting precipitation thus restricting water availability to roots that occur immediately beneath the carpet. Only heavy rainfall (>20 mm based on a laboratory estimate) and/or spring snowmelt would exceed the water-holding capacity of the mosses. Such precipitation events are infrequent in the Boreal Mixedwood Ecoregion (Anonymous 1978-1982). It is not known whether the observed adjustment of jack pine rooting depth is an isolated case or an example of a widespread phenomenon, but the successional implications are important. This importance stems from the biological interaction of mosses and trees, and the possibility that mosses may influence successional trends and rates. The mechanisms responsible for this phenomenon are not known. Studies of nutrient and water availability, [mycorrhizal associations,] and pathogens may provide further insight to this interesting problem.

Trees of late-successional stands with moss carpets (i.e. Stands 4 and 6) may avoid this problem by developing root systems within the moss carpet. In this case, the moss carpet may act as nutrient reservoir (Weber and Van Cleve 1981) for those plant species capable of tolerating the associated drought conditions. Under these conditions white spruce and balsam fir could competitively replace jack pine and aspen communities as a result of differential nutrient availability. Climax species growth would be promoted while seral species vigor would decline due to nutrient deprivation.

Roots were concentrated near the ground surface in all 11 stands. Eight of the 11 stands had 50% of all roots within a 15 cm zone which usually occurred within 5 cm of the forest floor. If root biomass were considered, more than 90 percent of all root biomass would probably occur within this near-surface rooting zone. Such root concentration zones have been observed by other researchers (e.g., Adams and Chapman 1941, Preston 1942, Vogt *et al.* 1981). Why roots occur near the ground surface even on xeric sites is not clear, but an orientation to nutrients leached from litter, to water from summer precipitation, and to favorable soil temperatures is hypothesized. Also, the apparent asymmetric pattern of root densities in Figures 2 and 3 may reflect the differential availability of plant nutrients and mechanical constraints such as soil density. The scattered residuals in the lower portion of the diagrams may be related to low sampling intensity rather than root distribution variability.

CHAPTER III

ROOT-SYSTEM MORPHOLOGY OF COMMON BOREAL FOREST TREES IN ALBERTA, CANADA[1]

ABSTRACT[2]

Twenty-four specimens of 6 boreal tree species were excavated: 8 *Pinus banksiana* Lamb., 5 *Populus tremuloides* Michx., 4 *Picea glauca* (Moench) Voss, 3 *Picea mariana* (Mill.) BSP., 2 *Abies balsamea* (L.) Mills., and 2 *Larix laricina* (Du Roi) K. Koch. Root systems were described, and percent biomass determined for above- and below-ground components for half these specimens. Tree ages ranged from 3 to 120 years. Horizontally spreading lateral roots dominated the root systems of all species and occurred within 3-15 cm of the ground surface. Nutrient and moisture absorption appear to be the principal functions of lateral roots. Maximum vertical root growth occurred near the tree stump as tap-, heart, sinker, and oblique lateral roots. Vertical root morphology is influenced by site conditions. In addition to providing mechanical support, sinker and taproots may be important adaptations for deep water

---

[1] Reproduced by permission of the National Research Council of Canada from Canadian Journal of Forest Research, Volume 13, 1983. pp. 1164-1173.

[2] [ ] represent additions to the text relative to the published version.

utilization on xeric sites.

Our data suggest that roots may be important in boreal succession processes through two related mechanisms: (1) nutrient and water deprivation occurs through preemptive growth of tree roots from climax species over roots of seral species, and through interception by mosses; and (2) niche partitioning occurs below-ground between seral and climax, and among climax tree species, by vertical separation of root systems.

INTRODUCTION

Succession from seral to climax communities in the Boreal Forest Region has been attributed to the superior competitive ability of climax species such as white spruce (*Picea glauca* (Moench) Voss)[3] and balsam fir (*Abies balsamea* (L.) Mills.) (e.g., Horton 1956, p. 24-25; Rowe 1956). However, the factors responsible for the replacement of one boreal tree species by another have not been well documented. Differential life span, shade tolerance and nutrient uptake ability of species as well as biologically induced changes of site conditions are often considered responsible (Daubenmire 1968, Barbour *et al.* 1981). If the possible mechanisms of succession are to be identified and tested, much research is required. A mechanistic approach *sensu* Harper (1977) should provide a more satisfying explanation than treating succession as the result of unspecified interactions among species. Below-ground such mechanisms could include, e.g., increased nutrient absorption rates, increased quantities of fine-roots for absorption, and varied rooting depths for more effective and less competitive resource extraction. These latter two possibilities will be considered in this paper.

---

[3] Taxonomy follows Moss 1959.

Root analysis may add significantly to our understanding of boreal forest succession. Owing to the labor-intensive nature of this research the role of plant roots in succession has not received the attention it deserves. The statement "Very little is known of the root habits of forest trees" made by Cheyney in 1932 is still true of most boreal tree species.

The study area occurs southeast of Lesser Slave Lake in central Alberta. The climate, site conditions, and vegetation have been described by La Roi and Ostafichuk (1984) and Strong and La Roi (1983a) and are typical of the largest ecoregion (Boreal Mixedwood) of Alberta, which covers *ca.* 40% of the province (Strong and Leggat 1981).

To our knowledge, no previous research in Canada has systematically compared the root system morphology of different boreal tree species within a restricted geographical area, except that of Bannan (1940). It is difficult to compare root system data from trees studied in widely separated areas because of potential ecotypic and site variations, and still more difficult to infer how root systems might contribute to forest succession. Hence, the objectives of this paper are to (1) describe the root systems (position, size, and biomass distribution) of six boreal tree species in one study area, (2) interpret the ecological significance of these root system patterns, and (3) suggest some successional implications.

METHODS

Jack pine (*Pinus banksiana* Lamb.), white spruce, black spruce (*Picea mariana* (Mill.) BSP.), balsam fir, larch (*Larix laricina* (Du Roi) K. Koch), and aspen (*Populus tremuloides* Michx.) were the species chosen for study because they are the most widespread and abundant trees of the Boreal Forest Region in North America. Individual trees were selected for study on the basis of site conditions, age, and general above-ground health. Severely suppressed or deformed specimens were avoided. An attempt was made to harvest only trees in the 35-40 year age range, but this was not always possible. This range of ages was selected because of its relative abundance throughout the study area.

Tree harvesting began by felling at ground level. The above-ground portion of the tree was separated into leaf, live branch, fruit, and bole components. Dead branches were discarded. In 11 of the 12 trees the entire above-ground portion was taken for total, oven-dry biomass determination. A 60 year old jack pine was the exception; its branch, leaf, and fruit component weights were estimated by sampling methods similar to that of Hegyi (1972). All boles were sampled by removing 10 cm disks at 1 m intervals beginning at the butt. Disks were used to determine tree age and estimate bole weight.

The below-ground portion of the tree was classified into two components: lateral and vertical root components. Biomass weights were estimated for lateral roots by sampling. Lateral roots located for detailed excavation by removing litter and soil materials from around the stump. These roots were then counted, their maximum diameters measured, and two or three selected at random for detailed excavation. All lateral roots which exceeded a specified diameter (usually 2 cm) were then cut from the stump; severing occurred where the root exceeded the specified diameter. When lateral roots were abundant, or varied greatly in size, or both, more than one sample of 2-3 roots was taken, each with its own maximum diameter (e.g., 1, 2, and 4 cm). The stump together with unsevered laterals, those less than the specified diameter, and all of its vertical roots were then excavated and photographed.

An attempt was made to extract all the roots when excavating lateral and stump roots; however, the smaller the root the greater the probability of breakage and loss. A recovery efficiency of >75% was qualitatively estimated for roots with a diameter of <2 mm, whereas efficiency was at least 95% for roots >2mm and 100% for >5 mm. Shovels, hand trowels, dissecting probes, and forceps were used for excavation.

The vertical root component contained tap-, sinker, heart, and obliquely descending roots; the lateral component consisted only of lateral roots. After collection all roots were [cleaned of soil,] clipped and grouped into five diameter classes: 0-2, 2-5, 5-20, 20-50, and >50 mm, then dried in a forced air oven at 65° C. Roots were considered dry when water loss did not exceed 1% of the total weight after drying for 12 hours.

Total lateral root biomass was estimated as the sum of (1) detached lateral root samples (estimated from root count and mean biomass per size class), (2) the weight of attached lateral stump roots, and (3) the weight of lateral root stubs attached to the stump.

In addition to the 12 harvested trees, 12 specimens on other sites were partially excavated for comparison of below-ground components. During all excavations measurements were taken of root depth and radial spread, i.e. the maximum radial distance that excavated lateral roots extended from the tree stump; in the special case of aspen, a clonal species, the midpoint of roots connecting members of the same clone were used to estimate radial spread. All trees were excavated during the summer of 1982; trees used for biomass estimates were harvested in August.

RESULTS

Black Spruce

Two trees were excavated from a 55 year old black spruce stand growing on a Terric Mesisol soils (Stand 7). Tree density (i.e. >1 cm dbh) averaged 6,000 stems ha^{-1}. The water table was within 10-30 cm of the ground surface depending upon the hummocky relief. A third tree was partially excavated from a subclimax black spruce/feathermoss community (Stand 8). In this stand tree density averaged 10,000 stems ha^{-1} and soils were poorly drained Humic Gleysols and Terric Humisols (Table 5).

The harvested 40 year old black spruce tree was 4 m tall (Table 6). Its total dry biomass was 5.4 kg, 69% of which occurred above-ground, making its root:shoot ratio of 0.45 the third highest of the 12 harvested trees. Roots of

Table 5. Stand age and selected site conditions.

Stand Number	Dominant Vegetation	Stand Age (yrs)	Parent Material	Soil Texture	Soil Great Group
Jack Pine/Sand Series					
1	Pinus/Arctostaphylos/ Cladina	40	Aeolian	Sand	Eutric Brunisol
2	Pinus/Arctostaphylos/ Cladina	60	Aeolian	Sand	Eutric Brunisol
3	Pinus/Alnus/Aralia/ Pleurozium	85	Aeolian	Sand	Eutric Brunisol
4	Picea-Abies/Hylocomium	170	Aeolian	Sand	Eutric Brunisol, Gray Luvisol
Aspen/Sand Series					
10	Populus/Alnus-Prunus/ Aralia	48	Aeolian	Sand	Eutric Brunisol
9	Populus/Alnus-Prunus/ Aralia	79	Aeolian	Sand	Eutric Brunisol
Aspen/Clay loam Series					
11	Populus/Calamagrostis/ Aralia	19	Outwash/ Moraine	Sandy loam/ clay loam	Gray Luvisol
5	Populus-Picea/Viburnum-Aralia	72	Sandy loam/ clay loam	Outwash/ Moraine	Gray Luvisol
6	Picea-Populus/Viburnum-Aralia	115	Sandy loam/ clay loam	Outwash/ Moraine	Gray Luvisol
Black Spruce/Organic Series					
7	Picea/Ledum/ Aulacomnium	55	Organic	Organic	Terric Mesisol
8	Picea/Pleurozium	122	Organic/ Aeolian	Organic/ Sand	Humic Gleysol, Terric Humisol

Table 6. Tree Characteristics and Percent Biomass of Morphological Components by Species.

	Black Spruce	Larch	White Spruce	White Spruce	Balsam Fir	Aspen/ Clay	Aspen/ Sand	Jack Pine	Jack Pine	Jack Pine	Jack Pine	Jack Pine
Stand Number	7	7	3	5	4	11	10	2	1	1	2	2
TREE CHARACTERISTICS												
Height (m)	4.0	10.3	10.3	10.8	4.6	7.6	15.6	0.23	3.7	7.2	13.5	18.0
DBH (cm)	4	9	9	10	4	5	11	-	3	12	18	22
Stump Diameter (cm)	7	13	12	13	6	7	13	0.25	5	14	26	33
Age (yrs.)	40	34	35	43	33	19	45	3	9	23	37	57
Above-ground Biomass (kg)	3.7	42.2	22.1	23.1	2.6	6.1	39.7	-	1.4	27.5	142.0	301.0
Below-ground Biomass (kg)	1.7	22.4	6.7	7.6	0.6	2.1	8.6	-	0.5	12.5	20.7	60.8
Total Tree Biomass (kg)	5.4	64.6	28.8	30.7	3.2	8.2	48.3	0.002	1.9	40.0	162.7	361.8
Root:Shoot Ratio	0.45	0.53	0.30	0.31	0.24	0.35	0.22	0.34	0.33	0.46	0.15	0.20
PERCENT ABOVE-GROUND BIOMASS												
Leaves	22.6	5.3	17.7	7.1	20.6	3.9	2.1	23.5	20.6	11.6	5.3	4.6
Branches	12.6	21.8	12.5	13.0	21.5	11.8	5.1	5.3	13.3	20.6	20.1	13.8
Fruits	0.2	0.9	-	-	-	-	-	-	0.6	2.6	2.9	5.4
Bole	33.6	37.3	46.4	55.2	38.8	58.6	75.0	46.1	40.5	33.9	59.0	59.4
PERCENT TOTAL	69.0	65.3	76.6	75.3	80.9	74.3	82.2	74.9	75.0	68.7	87.3	83.2
BELOW-GROUND COMPONENTS												
Root Depth (m)	0.3	0.3	0.35	0.5	1.3	0.5	1.5	0.3	1.2	1.1	1.5	2.0
Radial Root Spread (m)	3	9	7	7	2	2	2	0.8	3	6	8	14
Surface Root Depth (cm)	7-10	5-10	5-10	5-7	5-7	3-8	3-8	2-10	4-12	4-12	4-12	4-12

Table 6. *Concluded.*

Stand Number	7	7	3	5	4	11	10	2	1	1	2	2
Root-Spread:Tree-Height Ratio	0.75	0.87	0.68	0.64	0.43	0.26	0.12	3.48	0.81	0.83	0.59	0.78
Percent Vertical Root	-	-	5	+	27	-	1	24	26	4	18	10
PERCENT BELOW-GROUND BIOMASS[a]												
Stump[b]	7.7	7.4	11.4	4.2	4.9	9.2	6.1	-	8.0	5.0	3.1	5.2
50-200 mm	-	15.4	-	2.5	-	2.3	2.3	-	-	2.4	2.1 (1.1)	5.3 (0.4)
20-50 mm	3.8	5.8	3.2 (0.4)	3.7	2.1	8.3	3.1	- -	1.2 (1.4)	14.4 (0.4)	1.5 (0.5)	2.7 (1.1)
5-20 mm	10.1	4.5	5.5 (0.4)	9.1 (+)	3.0 (3.7)	4.7	4.0 (0.2)	-	3.4 (1.2)	3.6 (0.6)	2.5 (0.6)	0.6 (0.8)
2-5 mm	5.2	0.6	1.3 (0.2)	3.9 (+)	2.3 (1.0)	0.8	1.1 (+)	-	2.8 (1.5)	2.6 (0.1)	0.9 (0.1)	0.2 (0.2)
0-2 mm	4.1	1.0	0.8 (0.1)	1.3 (+)	1.7 (0.4)	0.4	0.8 (+)	19.0 (6.1)	3.0 (2.3)	2.0 (0.1)	0.3 (+)	+ (+)
PERCENT TOTAL	30.9	34.7	23.3	24.7	19.1	25.7	17.7	25.1	24.8	31.2	12.7	16.8

---

[a] Unbracketed values indicate percent horizontal root, bracketed values indicate percent vertical root.

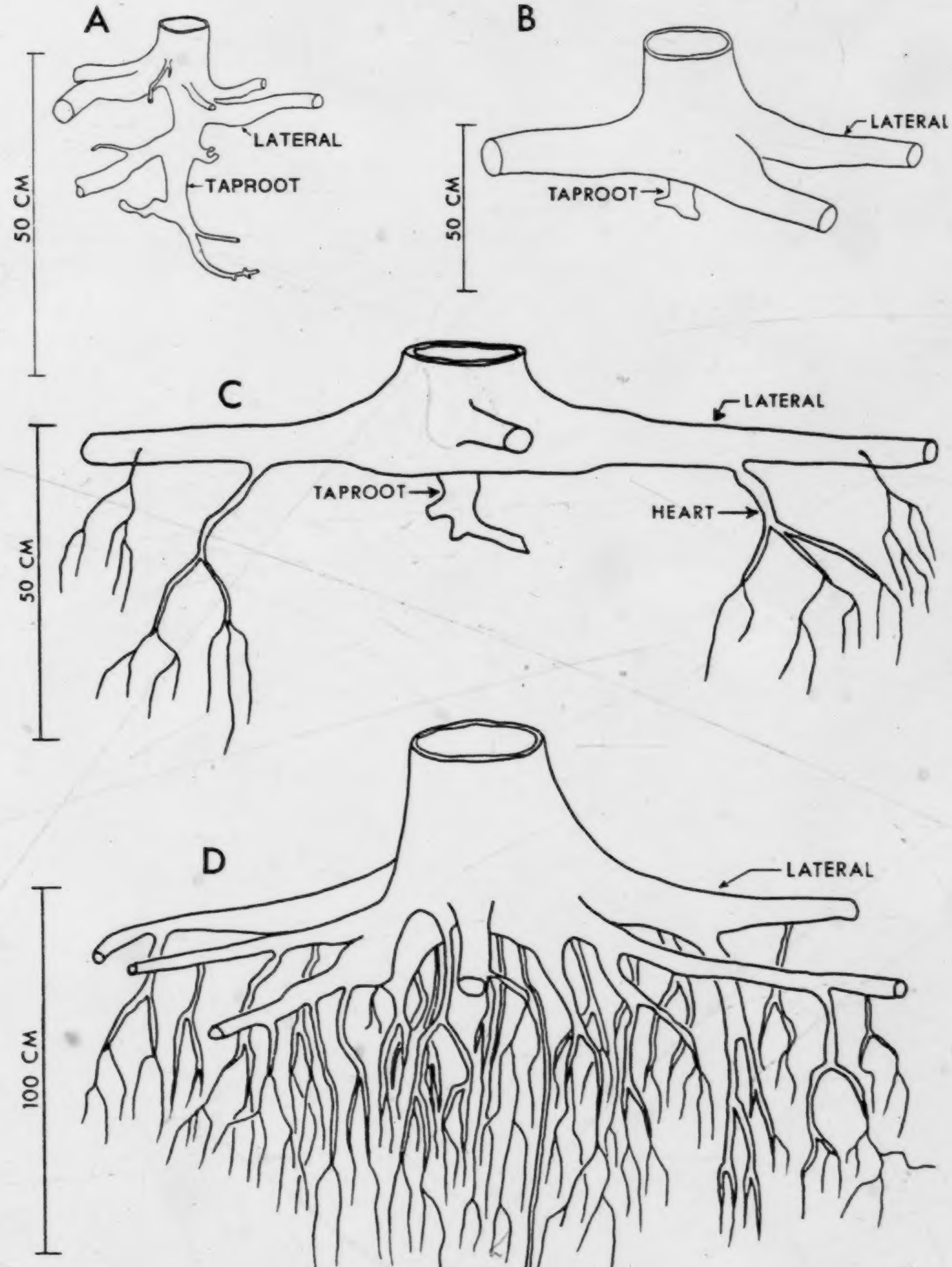
[b] Stump is defined as below-ground portion of the tree bole.

the 5-20 mm size class were most abundant in terms of biomass, but were few in number. Fine-roots (0-2 mm) were most numerous and occurred mainly at the distal portions of the root branches. Approximately 4% of the total tree biomass was fine-roots.

Most roots occurred 7-10 cm below the ground surface, just above the water table. Large roots (>20 mm) were most commonly found in hummocks, while finer roots occurred in both hummocks and hollows. Root spread was 3 m, giving a root-spread:tree-height ratio of 0.75. Maximum vertical root depth was only 30 cm and occurred near the tree stump, but these roots recurved toward the ground surface (Figure 4a). A dead aborted taproot was present.

The partially excavated tree from Stand 7 was approximately 3.5 m in height and 34 years old, while the tree from Stand 8 was 11 m tall and 120 years old. Both trees had rooting depths similar to those of the harvested tree. However, their root-spread:tree-height ratios were lower, 0.68 and 0.32, respectively. To summarize, the root system of black spruce consists of several horizontally spreading, near-surface, lateral roots which form a disk, with few if any functioning vertical roots.

Figure 4. The Vertical and Partial Horizontal Root System of (A), Black Spruce; (B), Larch; (C), White Spruce; and D, Aspen.


A
50 CM
LATERAL
TAPROOT
B
LATERAL
50 CM
TAPROOT
C
LATERAL
50 CM
TAPROOT
HEART
D
LATERAL
100 CM
SINKER

Larch

Two larch trees were excavated in Stand 7, and one of these was harvested. The harvested tree was 34 years old and 10.3 m tall; the other tree was 38 years old and 16 m tall. The larch root system was similar to that of black spruce: shallow and spreading. However, fine roots were less abundant and closer to the water table. Maximum rooting depth was approximately 30 cm. Larch had a higher rate of net biomass accumulation and height growth than did black spruce growing on the same site. Much of this accumulation was allocated to below-ground structures; larch had the highest root:shoot ratio (0.53) of the species studied (Table 6). About 15% of its root biomass was in the >50 mm size class, at least 3X greater than any of the other species. There was no evidence of vertical root development, although an aborted taproot was present on the harvested tree (Figure 4b).

White Spruce

Two white spruce trees were partially excavated and two others were harvested (Table 6). The first harvested tree was 35 years old, 10.3 m tall, and grew on aeolian sand in a jack pine/feathermoss community (Stand 3). The ground surface was relatively flat on the crest of a sand dune. The two partially excavated white spruce were from edaphically similar sites and were 19 and 58 years old, and

2.2 and 28 m tall, respectively. The second harvested tree was 43 years old, 10.8 m tall and occurred on shallow, sandy outwash deposits which overlie clay loam morainal deposits (Stand 5). The soil was a moderately well-drained Gray Luvisol (Table 5). The tree stratum was dominated by aspen and the understory by *Viburnum edule* (Michx.) Raf. and *Aralia nudicaulis* L. All white spruce trees were suppressed by jack pine and aspen during early stages of their growth, based on narrow annual growth rings.

Although the two harvested trees came from very different sites, they had a similar rooting pattern and allocation of biomass. From 4 to 6 horizontally spreading primary lateral roots formed the main components of the root system. These lateral roots were mainly found in the lower portion of the F and H horizons. Fine-roots were horizontally oriented, occurred at the distal portions of each root branch and formed a broad absorptive network concentrated in a band outside the tree crown. Radial root spread was approximately 7 m for both trees. Root-spread:tree-height ratios were 1.8, 0.66, 0.64, and 0.3 from young to old trees, respectively.

About 30 cm from the stump on the underside of each main lateral root there was a short (50-75 cm) obliquely descending root branch. Such roots have been termed "heart" roots by Wagg (1967) and probably have an anchoring function judging from their stout and dendritically branched character (Figure 4c). Heart roots appear to enlarge and elongate with increasing age. For example, these roots were lacking on the 19 year old tree, upto 50 cm long on 35 to 43 year old trees, and upto approximately 1 m in length on a 28 m tall tree, which was partially excavated in Stand 4. Heart roots were less well developed on fine-textured soils than those on sand.

Between the heart and first major branches of the main lateral roots were short, fine (<5 mm diameter) obliquely descending roots, originating from the sides of the lateral roots. Such roots may have both absorption and anchoring functions, based on their branched pattern and small diameter. These oblique roots penetrated to depths of 40 cm and appear to increase in number along the laterals as the tree increases in size.

More than 95% of root biomass occurred in the lateral component of the system (Table 6).

Aspen

Five aspen trees ranging in age from 19 to 79 years were at least partially excavated and examined on fine- (Stands 5 and 11) and coarse-textured (Stands 9 and 10) soils (Table 5). On all sites aspen were connected by "lateral roots" *sensu* Barnes (1966) in the mineral soil near the ground surface. Such lateral roots are most prominent during the early stages of tree growth, but are still very obvious on 79 year old, 24 m trees from Stand 9. Peridermal scar tissues marked the positions of former suckers, or ramets, that formed a much denser stand during the early development of the clone.

In sharp contrast with white spruce, the general root system morphology of aspen was distinctly different in sand compared with clay loam substrates. With increasing age on both substrates, however, aspen develops a second root system which supplements the the primary lateral roots that propogated the clone. Day (1944) also noted the development of such secondary root systems.

On sandy substrates secondary lateral and sinker roots develop. The secondary laterals grow outward from the tree and then descend sharply, with few branches except in the distal portions, to a maximum depth of 2 m (Stand 9). A few sinker roots usually occurred in the vicinity of the stump. "Heart like" roots were present on the undersides of some horizontal lateral roots, just outside the stump margin; these roots descended vertically to depths of 1 m, were stout, and very branched. In addition to lateral and heart roots, numerous stout and relatively short (<75 cm) roots developed beneath the stumps of some trees (Figure 4d).

On fine-textured substrates aspen had spreading horizontal to slightly oblique laterals and a sphere of short stout roots below the stump. These roots were secondary to the primary lateral root system responsible for vegetative reproduction of the population.

Vertically descending roots contributed only a small percentage (ca. 0.2%) to the total tree biomass (Table 6). Based on the harvested trees, aspen had from 3 to 5X more biomass above- than below-ground. The root systems of European aspen (*Populus tremula* L.) described by Kostler *et al.* (1968) are similar to those of the aspen excavated in this study.

Obliquely ascending fine-roots grew from the tops and sides of near-surface lateral roots of aspen. These roots were abundant, comprising 1 to 2% of the total aspen biomass (Table 5); most were located just below the soil litter (L) horizon.

Because no aspen trees were found in the 40-year age range on clay loam substrates, it is difficult to directly compare the biomass allocation of aspen in Table 6 with those of other species. However, the largest biomass percentages were again in the bole and larger root size classes as with most other trees. The leaf biomass component was only 10 to 50% of that of other species in a similar age category. Aspen had the lowest root-spread:tree-height ratios of the six species (0.26, 0.12) owing to its communal root system.

Jack Pine

A total of 8 trees ranging in age from 3 to 83 years were excavated and 5 of these were harvested. Seven trees were taken from open-canopied jack pine forests (Stands 1 and 2) with an understory dominated by *Arctostaphylos uva-ursi* (L.) Spreng. and *Cladina mitis* (Sandst.) Hale & Culb. (Table 5). The oldest tree (83 years) was partially excavated in Stand 3, which was dominated by a relatively closed-canopied jack pine tree stratum with an *Alnus crispa* (Ait.) Pursh and *Pleurozium schreberi* (Brid.) Mitt. understory. All trees were growing on Eutric Brunisol soils derived from aeolian sands which overlie beach sands at depths >1.5 m.

A consistent root-form was evident among the excavated trees, although some variation occurred. Horizontally spreading lateral roots were located in the upper 12 cm of the mineral soil, as noted by Cheyney (1932), Adams and Chapman (1941), and Kaufman (1945). From 4 to 6 primary lateral roots comprised the horizontal portion of the root system. The root-spread:tree-height ratios ranged from 3.48 in younger to 0.59 in older trees. Lateral roots comprised from 60 to 95% of all roots. Viewed from above, individual primary laterals and their secondary branches formed ovately-shaped root networks.

Vertical roots comprised <3% of the total tree biomass of older pines. The percentage was higher for younger trees (Table 6). Three distinctive types of vertical roots were found: taproot, sinker, and "herring bone". Large taproots were the principal vertical roots on all jack pines (Figure 5a), and extended to a maximum depth of 2 m, although 1.3 m was more common. Taproots were simple structures to depths of 50-90 cm, after which they branched into several smaller descending roots. Where temporary subsurface moisture zones occurred, these latter roots branched again and spread horizontally; this secondary branching was evident on the 40 year old tree and occurred at two different levels on the 60 year old tree. Cheyney (1932) observed very similar taproot branching patterns in jack pine under similar site conditions in Ontario.

Sinker roots originate from the lower surface of lateral roots (Figure 5a) and were more numerous closer to the stump. These roots, <10 per tree, were usually 1-4 cm in diameter, had little taper and few branches. Sinker roots and taproots branched in a similar manner and extended to similar depths.

"Herring bone" roots are defined as tapered, vertically descending roots with short (<2 cm), closely spaced,

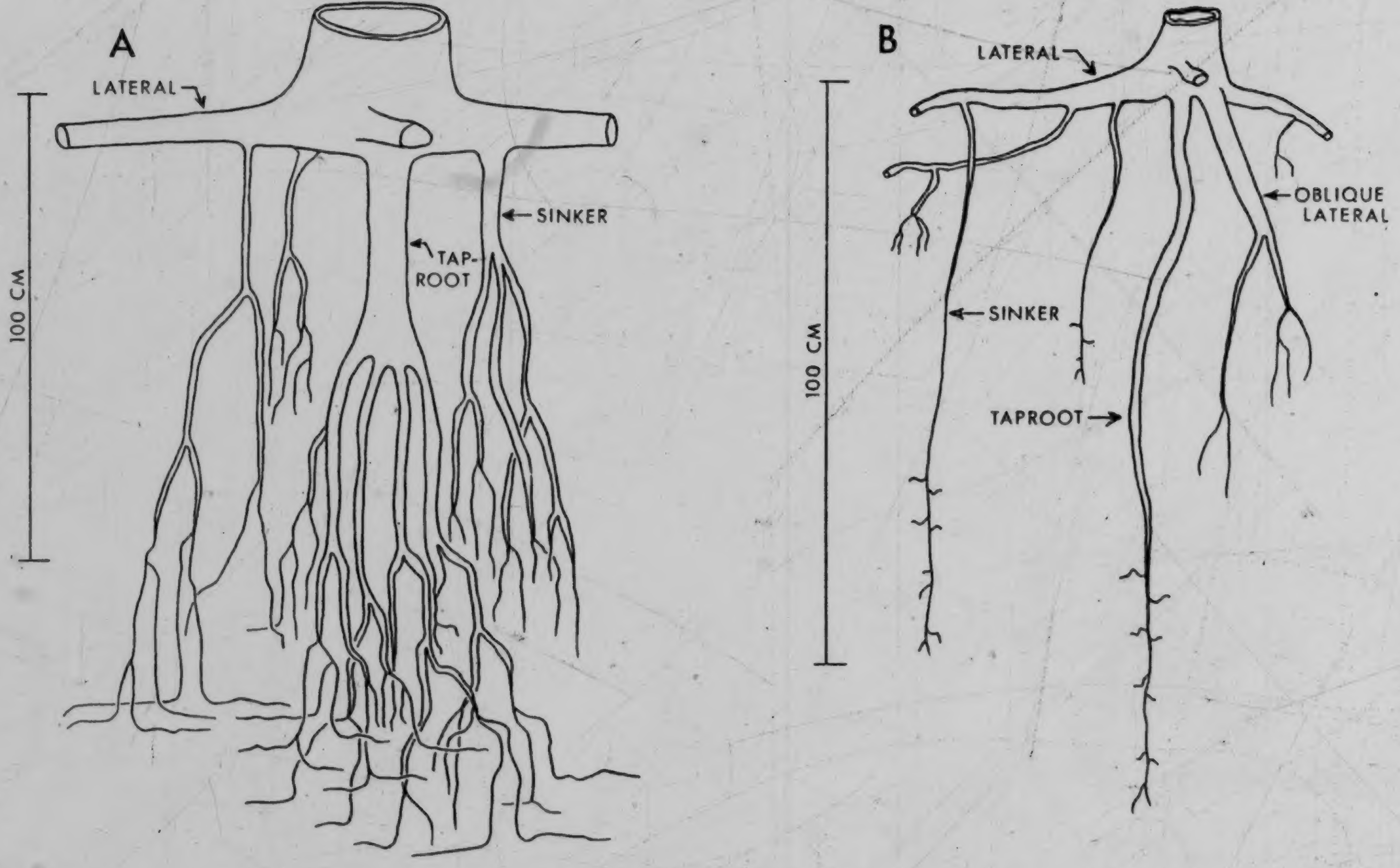

A
LATERAL
SINKER
TAP-ROOT
100 CM
B
LATERAL
OBLIQUE LATERAL
SINKER
TAPROOT
100 CM

Figure 5. The Vertical and Partial Horizontal Root System of (A), Jack Pine; and (B), Balsam Fir.

secondary branches occurring in a single plane. Such roots were less than 1 m in length and only occurred in the stump area of trees older than 30 years. These roots contributed little to root biomass, although several were present. Their function is not known. Fayle (1975) has described *Pinus resinosa* Ait. roots of a similar growth-form.

Balsam Fir

Two balsam fir trees were excavated. The first was 33 years old but only 4.6 m in height, probably because of suppression by taller white spruce and balsam fir trees. Edaphic conditions were similar to those of the jack pine and aspen on sandy sites. Soils in Stand 4 were classified as Brunisolic Gray Luvisols and Eluviated Eutric Brunisols, derived from well-drained aeolian sand deposits >2 m deep (Table 5).

This balsam fir specimen had a taproot, sinker roots, and obliquely descending and horizontally spreading lateral roots (Figure 5b). The lateral roots paralleled the ground surface in the F and H horizons which consisted primarily of feathermosses. Most fine-roots occurred on the distal portions of the lateral branches.

Oblique lateral, tap-, and sinker roots were confined to the mineral soil. Balsam fir had 5% of its biomass in vertically oriented roots, a percentage exceeded only by those of the 3 and 9 year old jack pines. The taproot was longer and narrower than that found on the small jack pine trees. Most oblique roots were more than 1 m in length. Maximum observed rooting depth was 1.3 m.

The second excavated balsam fir was 48 years old and 8 m in height. This tree was growing on glacial moraine deposits with site conditions similar to those described for white spruce on Stand 5 (Table 5). Lateral roots were mainly located in the lower portion of the FH horizons, although some small diameter roots were noted in the upper 5 cm of the mineral soil. The root-spread:tree-height ratio was 0.44, very similar to that calculated for the specimen growing on sand. Sinker, tap-, and oblique lateral roots were confined to the upper 40 cm of the mineral soil. All three vertical root-types were deformed and deflected to a horizontal direction of growth when the soil Bt horizon was contacted. Maximum vertical root length was *ca.* 1.3 m. Roots <2 mm were common on sinkers and oblique lateral roots in the mineral soil.

DISCUSSION

Biomass values for aspen boles, branches, and leaves in the study area fall between those found by Bartos and Johnston (1978) in the western USA and those reported by Johnstone and Peterson (1980) in western Canada (Table 7). Equations for aspen in the Great Lakes area (Pastor and Bockheim 1981) over-estimated biomass for various tree components. Allometric regression equations for jack pine by Hegyi (1972) and Alban and Laidly (1982) under-estimated biomass for trees in Stand 2, but they over- and under-estimated weights for trees in Stand 1, respectively (Table 7). Equations for bole weights (Singh 1982) under-estimated those of white spruce and larch, but were close to those measured for balsam fir and black spruce.

These comparisons indicate that above-ground growth rates and biomass allocation of trees within the study area are by no means anomalous or even unusual, when compared with other western North American studies. Hence a root:shoot ratio of 0.25-0.35:1 can be expected for many western boreal forest trees in the 35-40 year age range growing on mineral soils. Deviations from this prediction will occur in response to site conditions. Keyes and Grier (1981) have shown that stressed trees will often have higher root:shoot ratios than less stressed trees of the same

Table 7. Predicted and Measured Tree Biomass Values.

Species	Plot No.	Tree Age (years)	Source of Values	Subcomponent weights (kg)[a]				
				Bole	Branches	Leaves	Fruits	Total
Aspen	10	45	Bartos and Johnston (1978)	37.6	6.5	1.6	-	45.7
			Johnstone and Peterson (1978)	31.9	1.9	0.6	-	34.4
			Pastor and Bockheim (1981)	58.8	4.4	1.1	-	64.3
			Present study	36.2	2.5	1.0	-	39.7
Jack Pine	2	37	Hegyi (1972)	72.2	16.1	5.3	0.8	100.0
			Alban and Laidly (1982)	74.2	12.5	5.7	-	99.0
			Present study	96.0	32.7	8.6	4.7	142.0
	1	23	Hegyi (1972)	24.2	7.4	2.7	0.2	37.8
			Alban and Laidly (1982)	10.8	1.2	0.6	-	13.2
			Present study	13.6	8.2	4.6	1.0	27.5
White Spruce	3	35	Singh (1982)	6.1	1.3	-	-	-
			Present study	13.4	3.6	-	-	-
	5	43	Singh (1982)	11.8	2.6	-	-	-
			Present study	17.0	4.0	-	-	-
Balsam fir	4	33	Singh (1982)	2.6	0.6	-	-	-
			Present study	2.6	0.7	-	-	-
Black Spruce	7	40	Singh (1982)	2.0	0.7	-	-	-
			Present study	1.9	0.7	-	-	-
Larch	7	34	Singh (1982)	8.4	1.9	-	-	-
			Present study	24.1	14.1	-	-	-

---

[a] Subcomponent weights from previous studies are predicted values; subcomponent weights from the present study are measured values.

species.

In addition to providing information on root system morphology, the 5 harvested jack pine trees were used to test the null hypothesis that root:shoot ratios remain relatively stable with increasing jack pine age. However, responses by sinker and tap roots to soil moisture zones in Stand 2, the source of the two older trees, devaluated comparison of all members of the age series. Despite these noise problems an increase of below-ground biomass was evident with increasing tree age. Furthermore, the proportion of below-ground biomass increased by 25 to 30% between 9 and 23 and between 37 and 57 year old trees (Table 6). This trend seems to favor rejection of the null hypothesis [(i.e. the proportion of root relative to shoot increased with tree age.)]. In contrast, Sims (1964) and Eis (1974) found that the root:shoot ratios of very young jack pines and other conifers normally decreased with increasing age.

Horizontal Roots

All investigated root systems were dominated in terms of biomass by horizontally spreading lateral roots which generally occurred within the upper 15 cm of the soil. Jack pine and aspen lateral roots were confined to mineral soil horizons whereas black spruce, balsam fir, white spruce, and larch lateral roots were concentrated in the organic soil horizons. Roots may be concentrated near the ground surface in mineral soils as a trophic response to nutrient and water supply. Foster and Morrison (1976), Weber and Van Cleve (1981), and many others have shown that re-cycled macro-nutrients are concentrated in the soil litter horizons.

One of the many effects of fire on upland boreal forests is reduction or loss of the surface organic horizons (Austin and Baisinger 1955; Foster and Morrison 1976). Nutrient exchange in many post-fire, seral forests must, therefore, occur mainly in mineral soil horizons until new organic horizons develop. Hence it is to be expected that the lateral absorption roots of seral aspen and jack pine would be concentrated in mineral soil while those of climax white spruce and balsam fir are found mainly in the humus layer.

In poorly drained peatland ecosystems, black spruce and larch roots may be confined to a near-surface location due to a high water table and associated oxygen deficit.

Vertical Roots

In the study area, long tap-, sinker, and obliquely descending lateral roots seem to be important adaptations by jack pine, balsam fir, and aspen to utilize deep water sources and, hence, reduce water deficits on xeric sites. On mesic sites these roots would be less necessary. This conclusion is based on comparisons of aspen growing on different sites in the study area and accords with rooting habit studies (Horton 1958) of lodgepole pine (*Pinus contorta* Loudon var. *latifolia* Engelm.), a species which is morphologically similar to jack pine.

Heart and obliquely descending side-lateral roots of white spruce and oblique lateral roots of balsam fir are probably important for mechanical support, (i.e. anchoring) since their horizontal lateral roots grow in surface organic layers. Heart and oblique lateral roots would be less important on fine- than a coarse-textured soil because of the greater cohesion of soil particles and root-soil adhesion in fine-textured soils.

The relative development of these root-types probably depends upon plant needs, site-imposed restrictions, and genetic controls. Root development could be inhibited by high soil density, poor aeration, and/or high water table as suggested by Wagg (1967) and Eis (1970). The latter two factors are probably important in restricting the root depth of black spruce and larch in organic soils. However, soil density and compaction may limit root development on well to moderately-well drained, fine-textured, upland soils.

Bannan (1940), Horton and Lees (1961), and Schultz (1969) found rooting patterns of black spruce and larch similar to those of trees in this study; they also provided evidence for increased vertical root growth on better drained mineral soils. Schultz (1969) found prominent taproots on white spruce under most site conditions in the Great Lakes region. Both Wagg (1967) and Schultz (1969) attributed limited taproot development to the effects of soil texture, structure, excess moisture, and poor aeration. However, these factors do not adequately explain the limited taproot development of white spruce excavated from sandy sites in the study area.

In general, vertical roots were more varied, i.e. plastic in form than horizonal roots among specimen trees. This variability is probably a result of substrate conditions. High soil bulk density impedes vertical root development as in the case of balsam fir, while xeric soils tend to promote vertical root development (e.g., aspen). Of the 4 root system forms recognized by Wagg (1967), the root systems of white spruce in the study area would be classified as Restricted Taproot form, due to the very limited development of a taproot.

Succession

Tree root systems may play an important role in determining the direction and rate of plant succession in boreal forest. This study has yielded two possible mechanisms: (1) nutrient and water deprivation; and (2) niche partitioning.

The first mechanism is well illustrated in jack pine succession to white spruce, and involves the growth of white spruce roots above jack pine roots. Horizontal roots of jack pine normally occur in the mineral soil, whereas those of white spruce grow in soil litter and humus. The soil profile is thus partitioned vertically between the two trees, but white spruce had a better opportunity to absorb water and re-cycled nutrients than jack pine because of its superposition. Hence white spruce is favored.

Vogt *et al.* (1981) observed a similar edaphic shift of roots from mineral to organic surface horizons with increasing stand age, but their work concerned one species, Pacific silver fir (*Abies amabilis* (Dougl.) Forbs).

A more complex example of nutrient deprivation may be seen in aspen succession to white spruce, which involves synergistic changes in soil microenvironment, moisture and nutrients. As white spruce grows beneath the aspen canopy the forest litter slowly changes from nutrient-rich, deciduous broad-leaf to nutrient-poor, evergreen needle-leaf litter. Increased and year-round shade as well as non-smothering needle litter encourage an increase in terrestrial moss cover. As moss cover expands a vertical partitioning of roots occurs, with white spruce roots growing in the moss carpet above the aspen roots. The moss carpet itself intercepts water and nutrients, further restricting the downward flow to aspen roots. Under these conditions white spruce is again favored.

The second mechanism involves long-term niche partitioning below-ground among climax species. White spruce and balsam fir can co-dominate late-seral and climax upland forests in the Boreal Mixedwood Ecoregion and adjoining ecoregions of Alberta (Achuff and La Roi 1977). Both species have horizontally spreading lateral roots which occupy the same soil horizons. However, the tap- and oblique lateral roots of fir extend much deeper than any spruce roots on medium- to coarse-textured soils. The differing below-ground distributions of spruce and fir roots may help explain how the two trees can co-exist on such soils.

Mueller-Dombois and Sims (1966) and Parrish and Bazzaz (1976) have found evidence of similar below-ground niche separations in co-existing herbaceous plant populations.

The deeper penetration of balsam fir roots may explain why the rooting depths of old-growth spruce-fir forests on sand is generally deeper than that of seral aspen or jack pine forests in the study area (Strong and La Roi 1983a). However, restricted downward growth of balsam fir roots on fine-textured soils could reduce the compatibility of white spruce and balsam fir by increasing niche overlap. Forest interpretations in the Prairie Provinces by Rowe (1956, p. 127) support the hypothesis that balsam fir is less competitive than white spruce on fine-textured soils (cf. coarse-textured soils). It is noteworthy that Schultz (1969) found white spruce to be consistently deep-rooted, even on fine-textured soils, in the upper Great Lakes region, where soil moisture is generally more plentiful than it is in the Boreal Mixedwood Ecoregion of Alberta. The extent to which these geographically correlated variations in rooting behavior are climatically or genetically controlled is unknown.

CHAPTER IV

SEASONAL PLANT-SOIL WATER RELATIONSHIPS IN SELECTED BOREAL FOREST COMMUNITIES OF CENTRAL ALBERTA [1]

ABSTRACT

Plant and soil water potentials were measured in 11 forest stands which were thought to represent four successional sequences: a Jack Pine (*Pinus banksiana* Lamb.), a Black Spruce(*Picea mariana* BSP.), and two Aspen (*Populus tremuloides* Michx.) Series. Measurements were taken on 72 plants of 21 species at 4 day intervals from early May to late August, 1982. Shallow-rooted ericaceous and/or evergreen species such as *Vaccinium myrtilloides* Michx., *V. vitis-idaea* L., and *Pyrola asarifolia* Michx. had the widest range of water potentials during the summer, whereas deep-rooted *Alnus crispa* (Ait.) Pursh had the narrowest range of values. Minimum morning (0700 hrs) water potentials ranged to -3.1 MPa. Differentiation among species was greatest during periods of maximum water stress.

All species had roots within the upper 2 dm of the soil, but some species of the Jack Pine and Aspen/Sand Series had roots which extended to 23 dm depth. Moisture was usually more available in the upper 2 dm and below 6 dm

---

[1] Submitted to the Can. J. For. Res. in early January 1984.

in the soil. The void of soil moisture between 2 and 6 dm was a result of depletion and limited downward percolation of precipitation. The 11 stands had species which displayed similar summer water potential patterns, but the rate and magnitude of response were variable. Aspen and jack pine stands growing on sand contained species which displayed the greatest variation in plant water potentials due to shallow-rooted plants such as *Vaccinium* and *Pyrola* species.

Observed variations in rooting depths and patterns of plant water potential are thought to support the hypothesis that niche partitioning occurs among co-existing boreal forest species. Since older stands seem to have shorter and less severe plant and soil moisture stress it appears that succession favors plants with water-conserving adaptations.

INTRODUCTION

Soil moisture is an important edaphic factor that influences the growth and floristic composition of most terrestrial plant communities. In the boreal forest its influence is reflected in communities that range from hygrophytic *Picea mariana* (Mill.) BSP.[1] (Black Spruce) through mesophytic *Populus tremuloides* Michx. (Aspen) to xerophytic *Pinus banksiana* Lamb. (Jack Pine) ecosystems. Soil moisture can originate from several sources, but ground water and precipitation are the most common sources. Most ecologists are familiar with the recharging effects of spring snowmelt and heavy rainfall on the availability of soil moisture. However, these events usually occur fewer than four times per summer in the Boreal Mixedwood Ecoregion of Alberta (Anonymous 1978-1982a). This means that sufficient water must be stored in the soil to meet plant community demands between recharges, and water losses must be regulated by individual plants, or severe deficits may occur.

Moisture is not equally abundant throughout the soil profile or growing season. As a result all species may not be equally influenced by soil moisture, particularly if they have different below-ground niches. Most have adaptations for tolerating, avoiding and compensating for water stress (Larcher 1975; Parker *et al*. 1982; Strong and La Roi 1983b). Their ability to cope with water stress may in part determine their survivorship and abundance as forest species and, hence, their role in plant succession.

---

[1] Vascular plant taxonomy follows Moss (1959).

Work by Strong and La Roi (1983a,b) within this study area (See Below) has shown that the majority of plant roots occur within 2 dm of the ground surface. This suggests that most plants are dependent upon water resources at or near the forest floor. However, some species such as *Populus tremuloides*, *Pinus banksiana*, and *Abies balsamea* (L.) Mill. have vertically descending tap- and sinker roots, and obliquely descending lateral roots which penetrate the soil to depths of 1-2 m. Some understory species have similar root system adaptations or other mechanisms for obtaining soil water. Such traits may represent adaptations for both survival and below-ground resource partitioning.

The objectives of this research were to determine the (1) summer pattern of soil water potentials, and (2) summer pattern of plant water potentials for 21 important vascular species in 11 boreal forest stands. This analysis will attempt to identify from what sources these plants obtain water and the degree of water deprivation they experience in selected forest communities.

STUDY AREA

The study area was situated in central Alberta 175 km north of Edmonton, near Lesser Slave Lake. Some of its environmental attributes have been described by Strong and La Roi (1983a,b) and La Roi and Ostafichuk (1984). The area possesses many ecological characteristics that are typical of the Boreal Mixedwood Ecoregion (Strong and Leggat 1981) in which it occurs.

Eleven study plots were established. Four plots (1-4) were members of a Jack Pine/Sand Series. These plots were located in two *Pinus/Arctostaphylos/Cladina* stands (Stands 40 and 60 years old), a *Pinus/Alnus/Pleurozium* stand (85 years old), and a *Picea-Abies/Hylocomium* stand (170 years old). All stands had well-drained, sandy textured, Eutric Brunisolic soils. The soils in Plot 4 graded to and included Brunisolic Gray Luvisols.

A Black Spruce/Organic Series (Plots 7 and 8) was composed of a 55 and 122 year old stands. The younger stand was floristically diverse with numerous shrubs and forbs, and *Picea mariana* <6 m in height. In contrast, the older stand was a mature *P. mariana/Pleurozium* community. Soils beneath these two stands were Organics, although Gleysols with a thick peat layer occurred in the older stand.

An Aspen/Sand Series was composed of Plots 10, 9, and 4. Plot 4 represents the potential subclimax stage of both the Aspen and Jack Pine/Sand Series, and will be used as such. *Populus* dominated the overstory vegetation of Plots 10 and 9, and formed closed-canopy forests. These stands were 40 and 79 years in age, respectively. *Picea glauca* (Moench) Voss occurred in the tall herb layer (0.1-0.3 m) of Plots 10 and 9, but also occurred sporadically in the tree canopy layer of Plot 9. Herbaceous species were abundant and shrubs such as *Prunus pensylvanica* L.f., *Amelanchier alnifolia* Nutt., and *Rosa acicularis* Lindl. were >1 m tall. Soils were well-drained, sandy-textured, aeolian deposits classified as Eutric Brunisols.

Three plots (11,5,6) composed an Aspen/Clay loam Series. These plots were located on clay loam morainal deposits overlain by 20 cm of sandy loam outwash. Plot 11 was the youngest stand at 19 years and was dominated by a 6 m tall *Populus* overstory. *Calamagrostis canadensis* (Michx.) Beauv. and *Aralia nudicaulis* L. were the dominant understory species. Plots 5 and 6 were later successional stages of this series. Dates of origin were 1910 and 1867, respectively. The understory vegetation in Plot 5 was less diverse than those of either 11 or 6. Diversity was higher in Plot 6 due to canopy openings created by the toppling of decadent *Populus* and occasional *Picea glauca*. *Populus* had only minimal cover in Plot 6, while *Picea* was dominant.

Viburnum edule (Michx.) Raf. and *Aralia* were common in both older stands; but evergreen vascular species and mosses were both more abundant in Plot 6. All stands had moderately well-drained Gray Luvisolic soils.

METHODS

Meteorological stations were located near the N-S termini of the study area *ca.* 14 km apart. Each station had a Lambrecht recording hygrothermograph in a Stevenson screen at standard height (1.5 m); a precipitation gauge; and a Taylor minimum/maximum air thermometer (Model No. 5458) 0.5 m above-ground (See Below). In addition, a set of minimum and maximum temperature thermometers (Manufactured to Atmospheric Environment Service standards by Zeal, England) were place in the Stevenson screen to calibrate the thermograph charts.

A Taylor thermometer and oone set of 3 Coleman blocks (electrical resistance cells for measuring soil temperature and moisture) were installed within each stand. Most instruments were located in either the NE or SW corner of permanent plots established by La Roi and Ostifchuk (1982). All Taylor thermometers were mounted on wooden stakes 50 cm above ground level in aluminum shields which faced north. Coleman blocks (Model MC-310A, measurements with Soil Test Meter Model MC-300) were buried at 7-10, 30, and 70 cm in mineral soils. In organic soils, blocks were placed 10 cm above and, 10 and 65 cm below the surface of hollows in hummocky terrain. Blocks were installed by coring 3 vertical 3 cm holes to within a few cm of the required depth. A block was embedded vertically into the soil at the bottom of each hole, the holes were filled with the extracted cores, and allowed to settle for one year. Coleman block resistance readings were converted to soil matrix potentials (Ψm) using a calibration curve which consisted of the log Ψm plotted against the log electrical resistance (Figure 6). This curve was constructed in a manner similar to that described by Colman and Hendrix (1949) which relied on the use of ceramic plate extractor system. All electrical resistance values were standardized to 15.5°C.

Precipitation was measured near each plot or pair of closely spaced plots with 2-liter white cylindrical cans (12.5 cm inside diameter opening) mounted 0.5-1.0 m above-ground on posts.

Plant water potentials (Ψt measured as xylem pressure potential) were estimated with a portable Scholander-type pressure chamber (PMS Instruments Company) at each sampling site. Seventy-two plants (one sample/species/stand), consisting of 21 species, were selected for measurement, all common members of each stand. The species used included

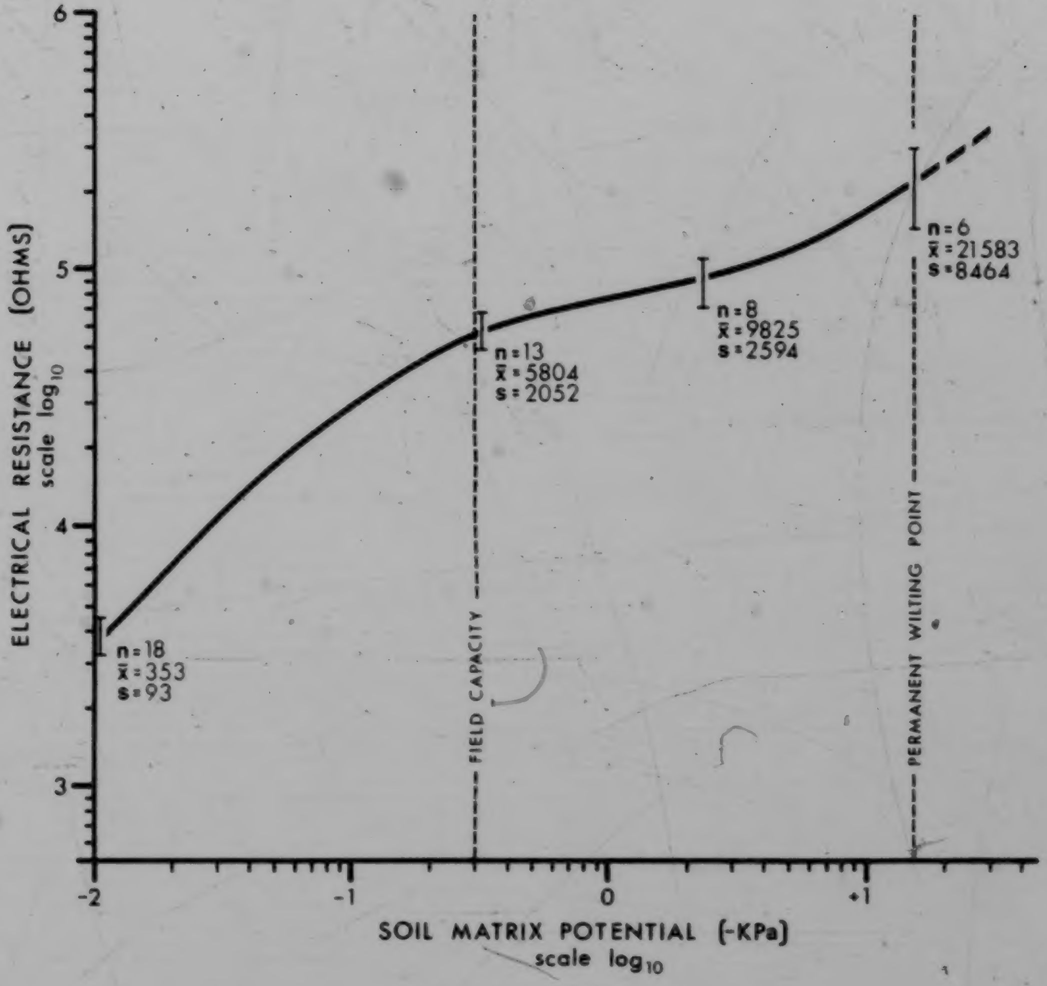


Figure 6. A Coleman Block Calibration Curve for Converting Electrical Resistance to Soil Matrix Potential in Sandy and Sandy Loam Textured Soils. Symbols indicate 95% confidence limits (⊢—⊣), mean ($\bar{x}$), standard deviation (s), and number of samples (n).

trees, shrubs, and semi-woody evergreens. Samples were usually 5-15 cm in length, composed of twigs with attached leaves, excised from the upper portion of each plant, and taken in a manner similar to the guidelines given by Scholander *et al*. (1965). Sample length was dependent upon plant stature. An attempt was made to collect "normal" specimens from near the location of the Coleman blocks. Trees >6 m in height were climbed to obtain samples from the upper half of the tree crown. When plants (e.g., *Pyrola asarifolia* Michx., *Cornus canadensis* L., and *Mitella nuda* L.) were small, a new individual was selected for Ψt measurement every 4 days, which resulted in a continuously enlarging radius for sampling due to a localized population depletion. In most cases the plants were obtained within 5 m of the designated sampling site.

Due to the geographical separation of stands and the large number of plant samples, it was necessary to develop diurnal Ψt correction curves. Such curves allowed direct comparison of species at a standard time (0700 hrs). Diurnal correction curves were constructed from hourly measurement of Ψt by species at each site on cloudless days in July (Figure 7). By substracting the initial morning pressure (0700 hrs) from subsequent hourly readings, a correction for increasing Ψt with time was possible (Appendix II contains initial data). this methodology allowed the estimation of Ψt for all species at a standard

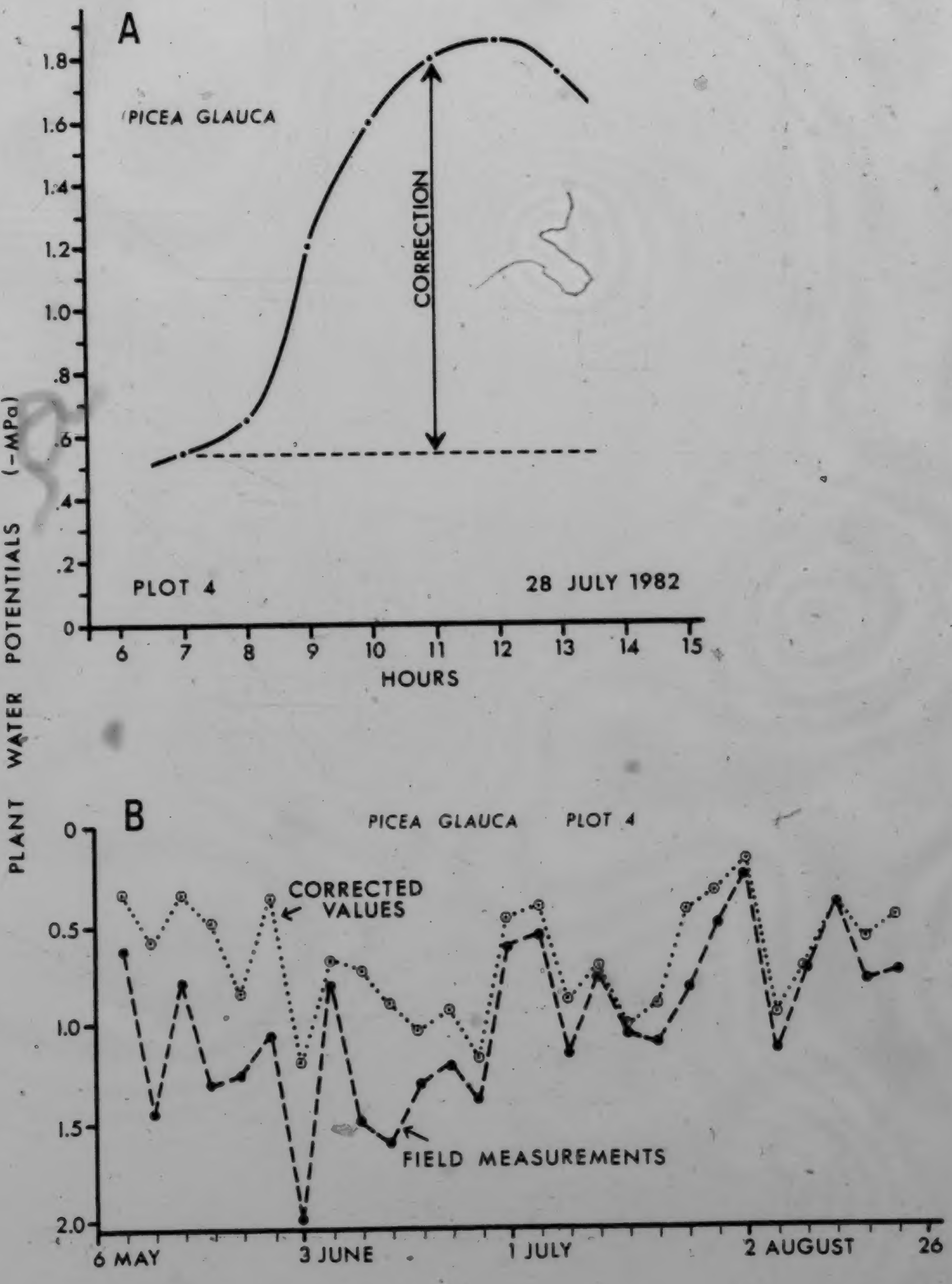


Figure 7. An Example of a Diurnal Curve (A) and Corrected and Uncorrected Plant Water Potentials (B).

time, because it was impractical to obtain these data directly.

In addition, Ψt values were corrected for varied solar radiation intensity due to cloud cover and smoke. These radiation corrections were 0.25, 0.5, 0.75, and 1 for >80, 80-30, 30-10, <10% cloud cover, respectively. These corrections were estimated from Belfort actinograph readings taken at the Hondo meteorological station. Such corrections are approximate, based on the assumption that transpiration rates increase with increasing radiation intensity (Sucoff 1982). Corrections were made as follows: (Field Ψt - (Ψt Time Correction x Radiation Correction)) = Estimated Ψt at 0700 hrs Mountain Standard Time (Figure 7). All Figures and statistical analyses were based on three-point moving averages (Spiegel 1961) of the estimated Ψt values, while reported minima were based on estimated Ψt values.

Taylor thermometers, Coleman blocks, precipitation gauges, and plant Ψt were read at 4 day intervals from May 6 through August 22, 1982. The plot sampling order was mixed continuously throughout the summer to avoid systematic bias. Readings were taken between 0600 and 1400 hrs MST. Plant Ψt readings were discontinued when minimum daily air temperatures fell below -2.2°C.

To determine maximum rooting depth, specimens were selected for excavation from designated plots near the sampling sites. Shovels, hand trowels, dissecting probes, and forceps were used for excavation. Sketches and notes were made of root positions, types, depths, and substrates.

Soil water-holding capacity (0.03 MPa minus 1.5 MPa water content) for mineral soil horizons was estimated with porous ceramic plate moisture extractor (Soil Test). Intact soil samples were collected in copper rings (5.2 cm I.D. by 2.5 cm deep) by horizon, sealed in plastic bags, and refrigerated at *ca.* 3°C until ready for processing. Prior to processing, samples were masked on the lower surface with a fine-mesh nylon cloth and soaked in distilled water for at least 24 hrs. After processing samples were dried at 105°C for 48 hrs. The water-holding capacity of organic horizons was estimated by soaking fresh samples in water for 24 hours, draining, weighing, drying, and reweighing. Water content was expressed as percent water by volume, for both organic and mineral soils. A total of three samples per horizon were used to estimate water-holding capacity.

RESULTS

Temperature

Summer (May through August) air temperatures in 1982 averaged 12.4°C at the two meteorological stations based on daily measurements. Maximum air temperatures (32°C) occurred in June, but highest mean temperatures (20.4°C) occurred in July. The freeze-free period (-2.2°C rather than 0°C which is used for frost-free period) extended from June 7 to August 23, i.e. 77 days. This period was 27 days longer than that measured during the summer of 1981 (La Roi and Ostafichuk 1982).

Average temperatures at 50 cm above-ground ranged from 1.3 to 2.8°C higher than those measured in the Stevenson screens. In general, open-canopy sites had the warmest extremes while closed-canopy coniferous stands such as Plot 4, 6, and 8 were coolest (Tables 8 and 9).

Temperatures just below the ground surface in closed stands ranged from 7 to 9°C cooler than air temperatures at 50 cm above ground level (Table 9). This temperature difference was less in open stands. Mean summer soil temperatures decreased with increasing depth. Maximum soil temperatures occurred in late July to early August. Surface soil horizons exceeded 0°C by mid-May; deeper horizons (70, 65, and 65 cm in Plots 4, 7, and 8, respectively), however, did not thaw until late June.

In general, a trend of decreasing mean summer air and soil temperature was evident with increasing stand age (Table 9).

Table 8. Monthly Air Temperature (Stevenson Screens) and Precipitation Estimated from two Meteorological Stations during the Summer of 1982.

		TEMPERATURE (°C)			PRECIPITATION (mm)	
Location	Month	Mean Minimum	Mean Maximum	Mean		
South Station	May	0.8	17.8	9.4		15.5
	June	5.0	23.6	14.3		4.0
	July	7.4	23.4	15.4		139.3
	August	4.1	17.3	10.7		93.0
	Summer	4.3	20.5	12.4	Total	251.8
North Station	May	0.8	16.7	8.7		15.4
	June	5.4	23.3	14.4		1.8
	July	7.7	22.5	15.1		139.5
	August	5.0	17.4	11.2		116.8
	Summer	4.8	20.0	12.4	Total	273.5

Table 9. Mean Air and Soil Temperature (°C) for Summer (May to August, inclusive) of 1982 by Plot in the Hondo-Lesser Slave Lake Area.

Location or Plot Number	Mean Air Temperature 50 cm Above Ground	Mean Soil Temperature by Depth (cm)			Plot Age (Years)
South Station	15.0	-	-	-	-
North Station	14.3	-	-	-	-
		7-10 cm	30 cm	70 cm	
Jack Pine/Sand Series					
1	14.9	10.2	9.7	8.3	40
2	15.2	10.5	10.4	8.7	60
3	15.0	6.2	5.6	5.1	83
4	14.0	5.9	6.0	4.7	170
Aspen/Sand Series					
10	15.1[a]	9.0	9.1	6.9	40
9	15.5[a]	7.5	7.5	5.9	79
4	14.0	5.9	6.0	4.7	170
Aspen/Clay loam Series					
11	-	-	-	-	19
5	15.0	7.4	6.6	5.7	72
6	13.7	5.7	5.6	3.8	115
		+10 cm	-10 cm	-60 cm	
Black Spruce/Organic Series					
7	14.9	5.9	5.5	1.3	55
8	14.3	5.6	4.1	2.3	122

---

[a] May mean temperature values estimated from thermometers within the vicinity of plot due to partially missing data.

Precipitation

Total precipitation averaged 246 mm (s=16.3) during the May to September period based on 10 recording sites. At the southern meteorological station, 63% of this precipitation fell during July and 26% in August; June was the driest month with only 14 mm. The distribution and quantities of precipitation received at the various sampling plots during the summer of 1982 are shown in Figures 8-12. Approximately 60% of the total summer precipitation fell during 3 events which lasted <7 days. The heaviest rain during a 24 hour period netted 41 mm. Frost, dew, and/or rain occurred on 86% of the days during the summer of 1982. Compared with 30-year precipitation normals at Slave Lake (Anonymous 1982a), the nearest long-term meteorological station, rainfall in the study area and at Slave Lake were higher than normal (Table 10). However, amounts in June and August were lower than normal, while July values in the study area were almost double the long term average for Slave Lake.

Convectional precipitation was common, but gave only small amounts of sporadically distributed rainfall. Major precipitation originated from cyclonic systems and distributed rainfall more evenly through the study area.

Average Plant Water Potentials (Ψt)

All plots had similar seasonal Ψt patterns, although individual species deviated from these general trends.

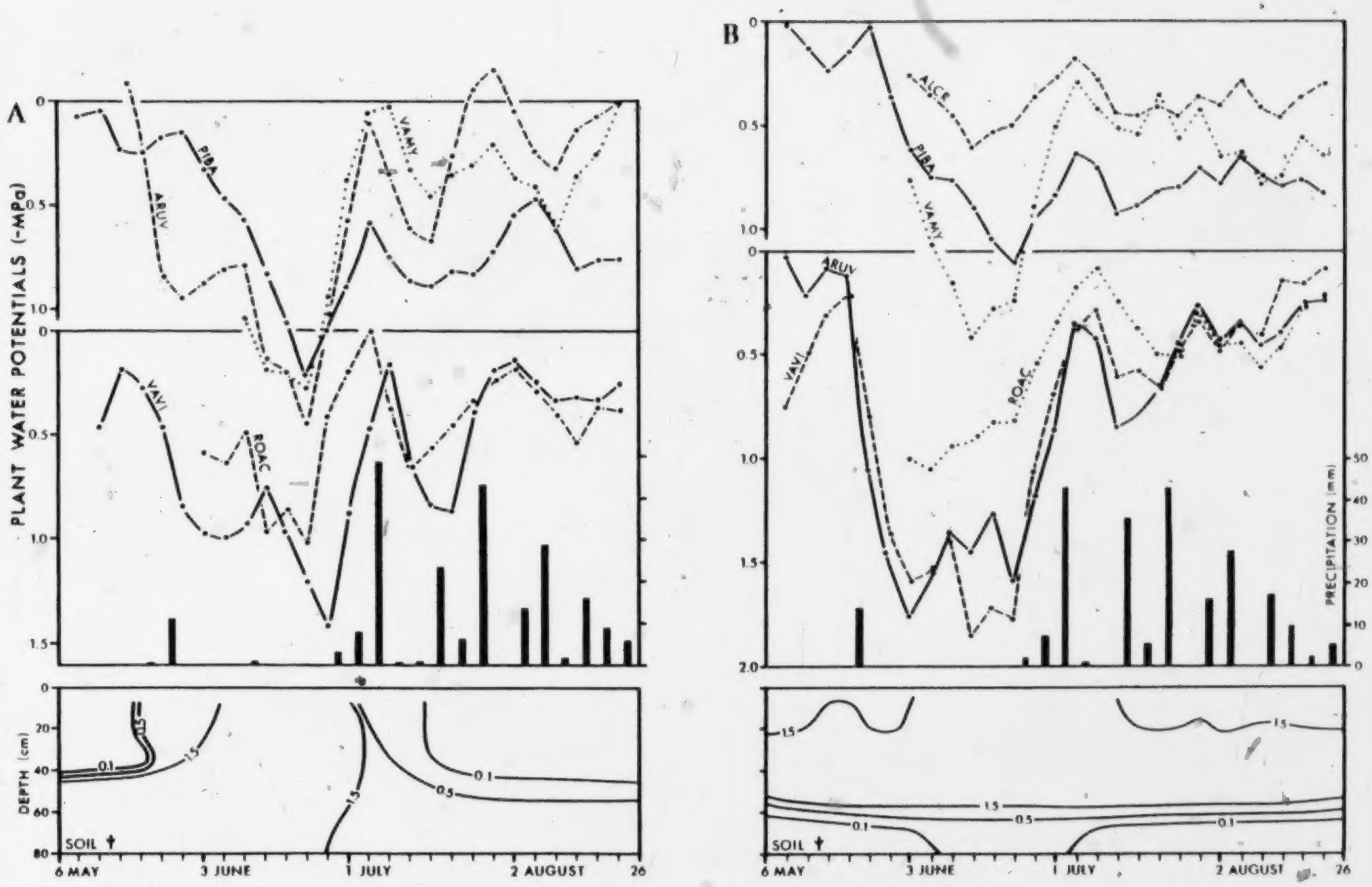


Figure 8. Summer Plant Water and Soil Matrix Potential (-MPa) for Plot 1 (A) and Plot 2 (B) of the Jack Pine/Sand Series.

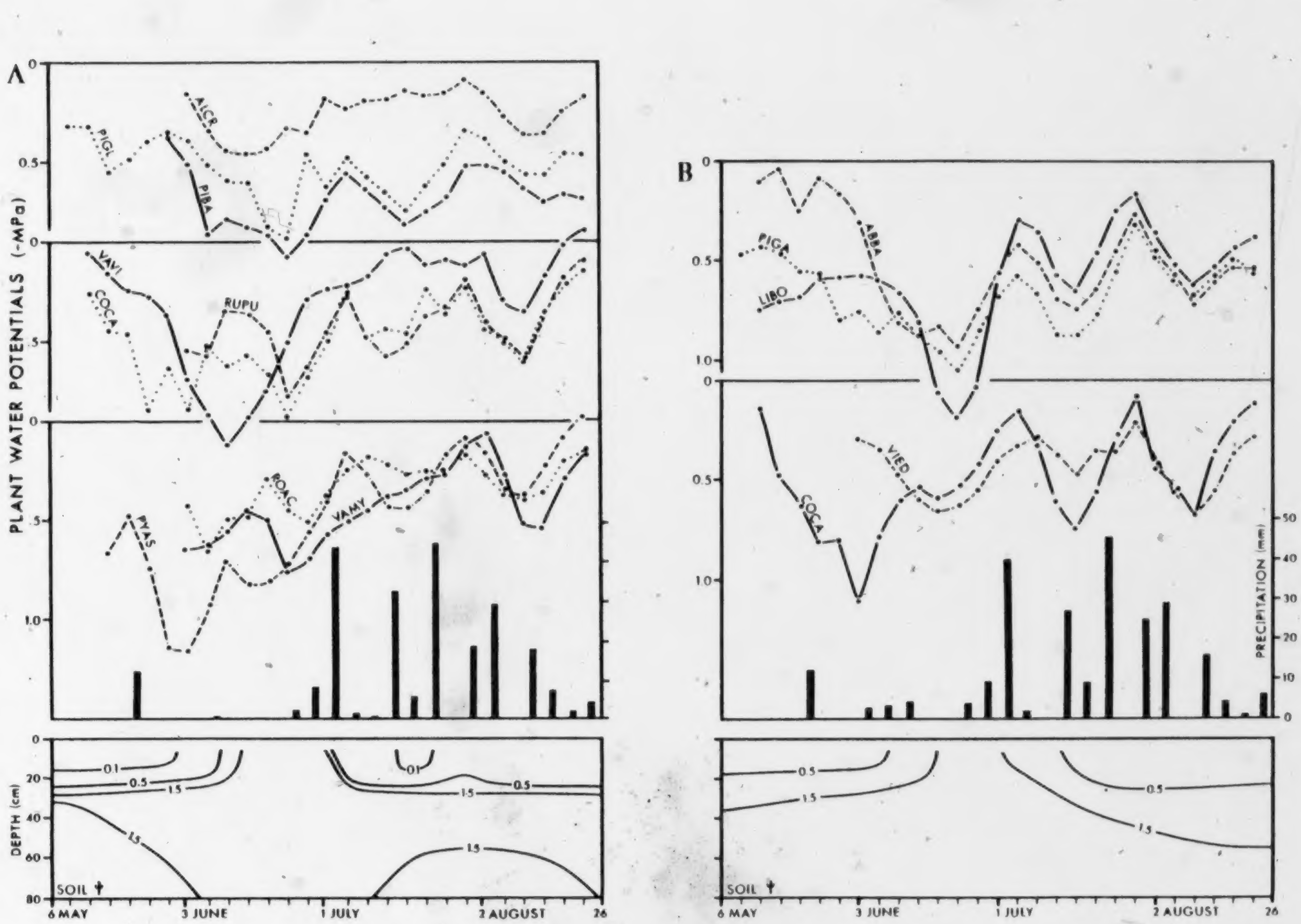


Figure 9. Summer Plant Water and Soil Matrix Potential (-MPa) for Plot 3 (A) and Plot 4 (B) of the Jack Pine/Sand Series.

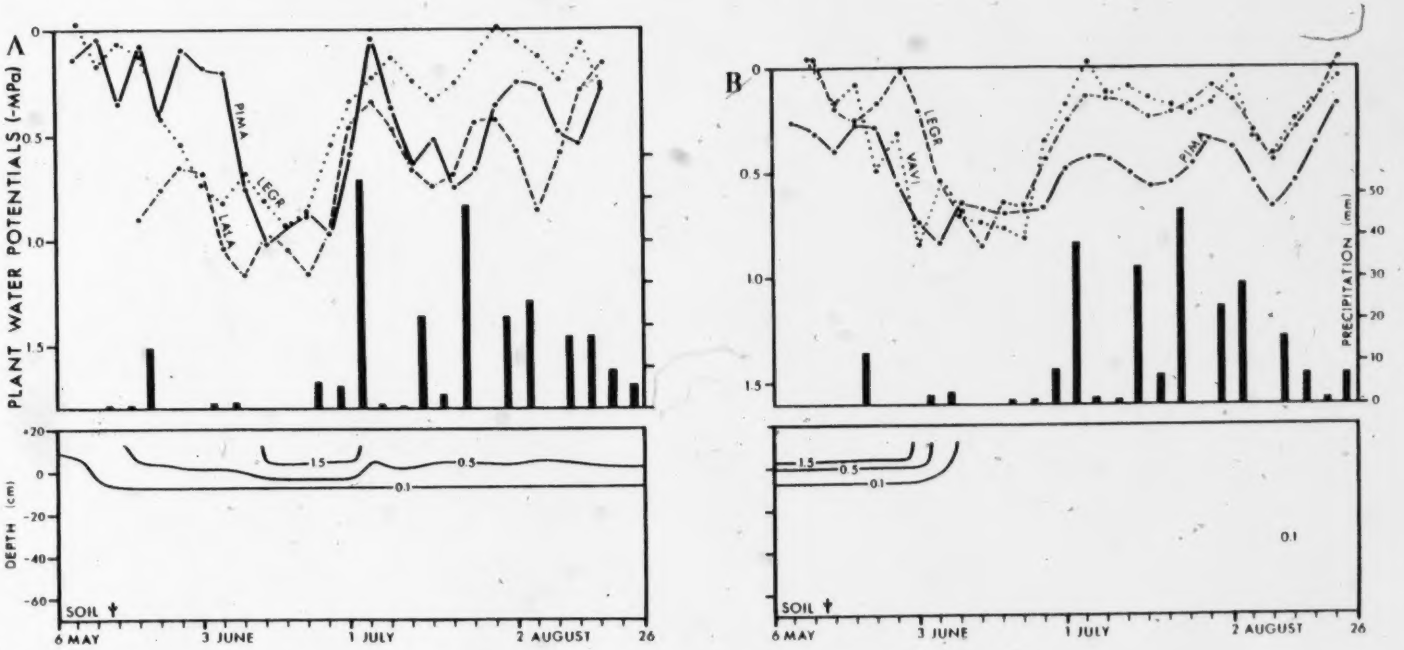


Figure 10. Summer Plant Water and Soil Matrix Potential (-MPa) for Plot 7 (A) and Plot 8 (B) of the Black Spruce/Organic Series.

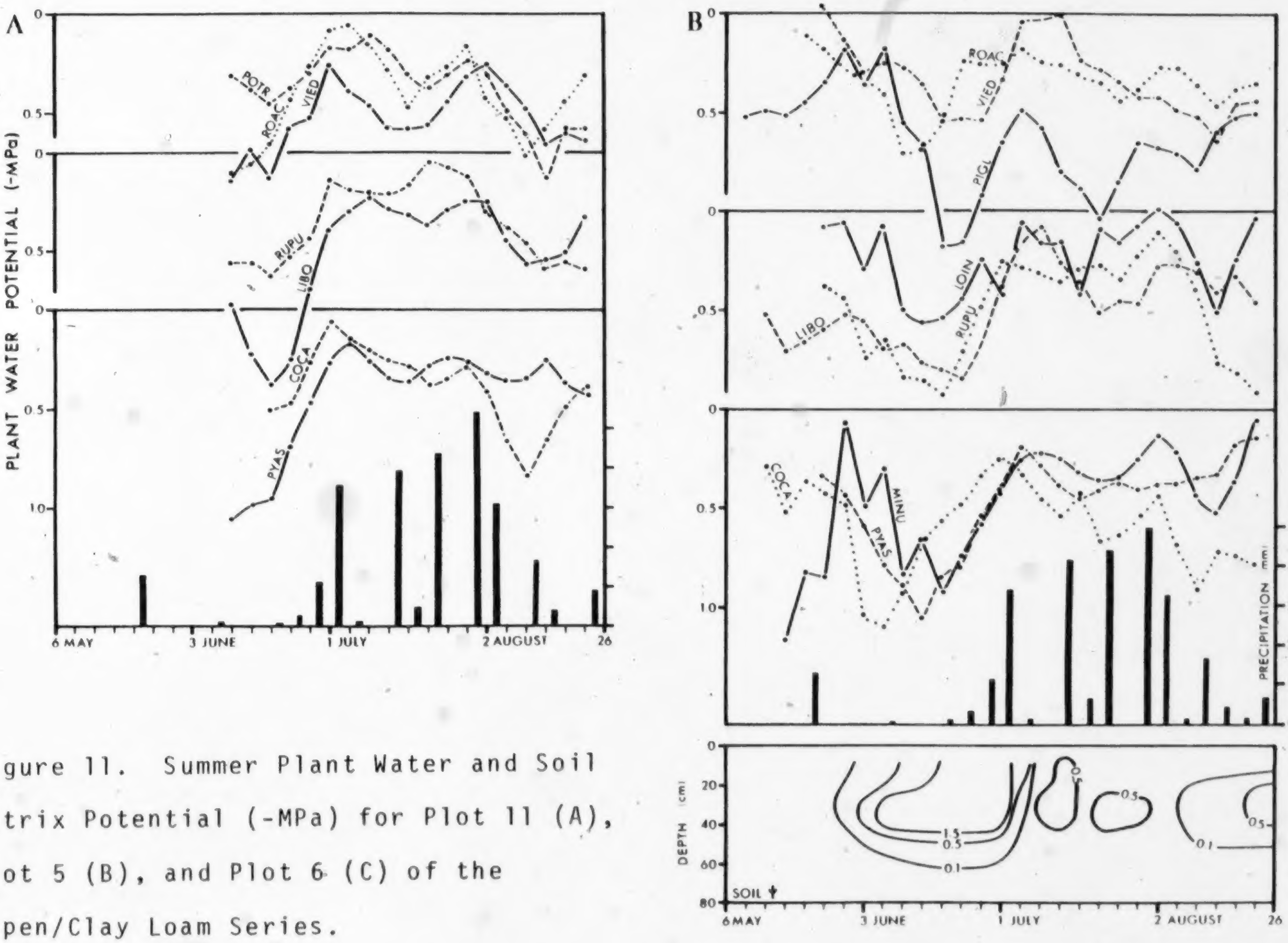


Figure 11. Summer Plant Water and Soil Matrix Potential (-MPa) for Plot 11 (A), Plot 5 (B), and Plot 6 (C) of the Aspen/Clay Loam Series.

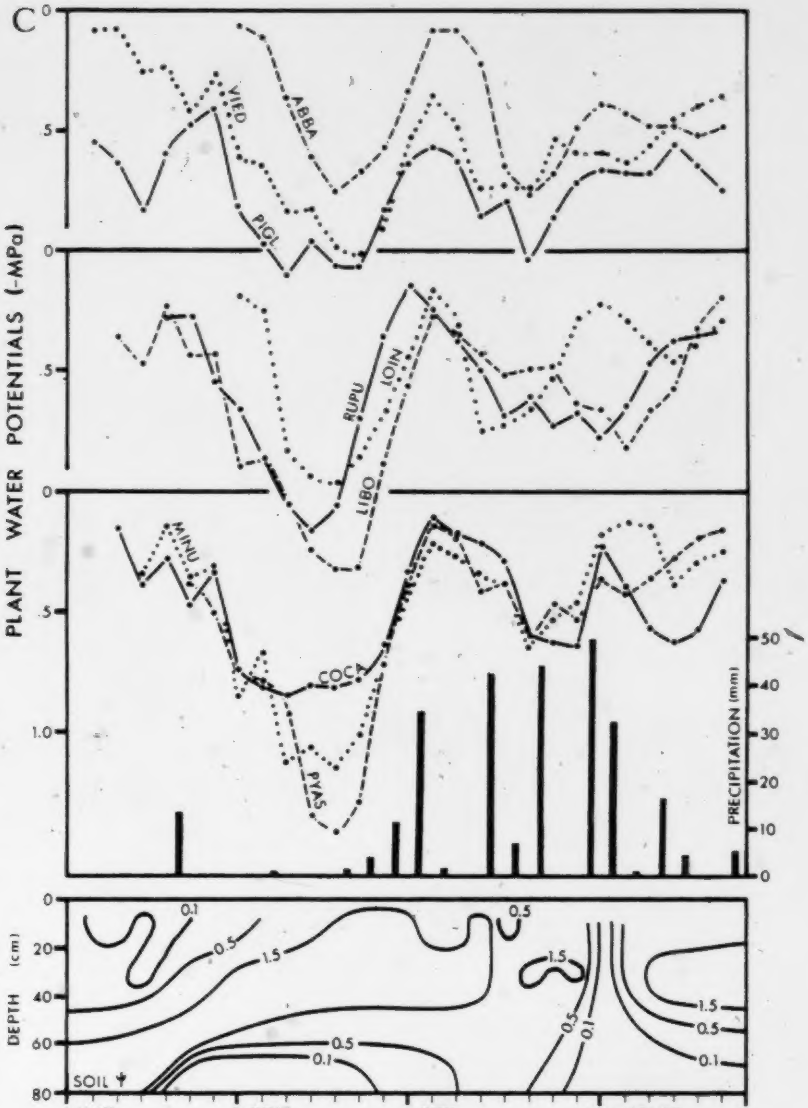


Figure 11. Concluded.

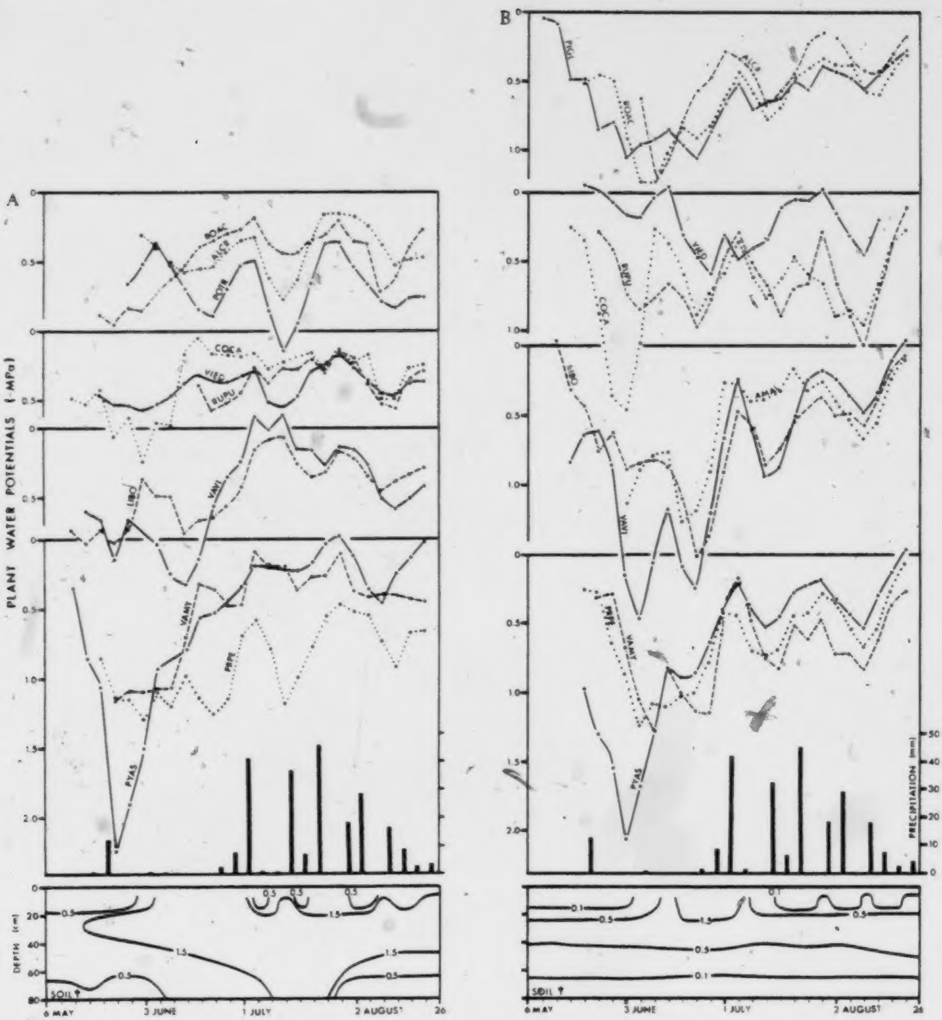


Figure 12. Summer Plant Water and Soil Matrix Potential (-MPa) for Plot 10 (A) and Plot 9 (B) of the Aspen/Sand Series.

Table 10. Summary of 1982 Summer Precipitation (mm) for Hondo Sites and Slave Lake Townsite.

	Study Area	Slave Lake	Slave Lake
	1982	1982	1951-80
May	13.7	21.8	10.6
June	14.2	10.5	43.9
July	154.7	131.2	79.5
August	63.8	118.0	87.6
Total (mm)	246.4	281.5	221.6

Values in early May were high, steadily decreased until the latter half of June, then increased sharply after late June when precipitation increased (Figures 8 to 12). The June depression was followed by a weaker dry episode in each subsequent month. Figure 8b best illustrates the June Ψt depression, while Figures 8b and 11b display distinctive July and August depressions.

Plant water potentials were measured for 6 tree species: *Pinus banksiana*, *Populus tremuloides*, *Abies balsamea*, *Picea glauca*, *P. mariana* and *Larix laricina* (Du Roi) K. Koch (Larch). The lowest Ψt values for these tree species ranged from -1.0 to -1.7 MPa with all, except *Pinus banksiana* (Plots 1 and 2) and *Larix laricina*, occurring in the first half of this range. *Pinus banksiana* and *Abies balsamea* had high spring Ψt values that decreased steadily throughout early summer, increased in early July, but then fell and remained depressed during July and August. *Picea glauca* tended to have lower spring Ψt values than *Pinus banksiana*, although their late summer values were similar. *Picea mariana* and *Larix laricina* had similar Ψt curves on Plot 7; however, *Larix* responded earlier and more strongly to moisture stress then did *P. mariana*. Ψt curves for *P. mariana* were more variable on Plot 7 than on Plot 8 (Figure 10a,b). *Populus tremuloides* Ψt was only moderately affected by the June dry period on both the sand and clay loam sites (Figures 11a,12a). However, *Populus* on Plot 10 had a cyclic Ψt curve with deeper July and August depressions relative to other species in the plot.

Alnus crispa (Ait.) Pursh was sampled in the Jack Pine (Plots 2 and 3) and Aspen/Sand (Plots 10 and 9) Series (Figures 8b,9a,12). This species had the narrowest Ψt range (0.7 MPa) and the highest Ψt values of the 13 species studied in the Jack Pine/Sand Series. In the Aspen/Sand Series its range of Ψt values was 1.2 MPa, also amongst the lowest in Plots 10 and 9. *Alnus* Ψt values averaged -0.32 and -0.45 MPa for the summer in the Jack Pine and Aspen Series, respectively. Only in Plot 9 (Figure 12b) did *Alnus* show a strong response to the June dry period that characterized most plots.

The greatest seasonal fluctuations in Ψt were exhibited by ericaceous and/or evergreen species such as *Vaccinium vitis-idaea* L., *V. myrtilloides* Michx., *Linnaea borealis* L., *Pyrola asarifolia*, *Arctostaphylos uva-ursi* (L.) Spreng, *Cornus canadensis*, and *Mitella nuda*. Minimum Ψt values ranged between -1.5 and -3.1 MPa with *Pyrola asarifolia* at the lower extreme.

Members of this group had the lowest Ψt values of the 21 taxa under consideration and also usually the lowest values in each plot (Figure 8a,8b,12b). Exceptions occurred on moist sites where Ψt values were ameliorated (e.g., *Vaccinium myrtilloides* and *V. vitis-idaea* in Plot 3). In addition, this group showed a marked depression in July and August, although less dramatic than the June depression period which lasted almost 4 weeks for some species (Figure 8a,b).

Rosa acicularis, *Prunus pensylvanica*, *Viburnum edule*, *Lonicera involucrata* (Richards.) Banks, and *Rubus pubescens* Raf. occupied an ecological position intermediate to *Alnus* and the *Vaccinium* group based on minimum Ψt values and curve position. Some of these species had Ψt patterns which differed from the normal trends of the plot. For example, Ψt values of *Rubus pubescens* increased during early June (Plot 3), and progressively decreased in late summer (Plot 5). Minimum Ψt values were -1.0 to -1.5 MPa and Ψt patterns were variable.

Rosa acicularis had very similar Ψt curves on a variety of sites, despite differences in edaphic and biotic conditions. This shrub displayed considerable morphological plasticity, including changing proportions of its above- and below-ground biomass. For example, deep sinking taproots and dwarfed shoots were characteristic of *Rosa* on sandy soils (Plots 1 and 2), while shoots were well-developed and below-ground biomass was minimal on clay loam soils. *Amelanchier alnifolia* showed similar shifts in root:shoot ratios from xeric to mesic sites.

Ledum groenlandicum Oeder occurred on both plots of the Black Spruce/Organic Series (Figures 10a,b). Its Ψt values were generally lower on Plot 7 and equal to or less negative than those of *Picea mariana*.

Rooting Depth and Minimum Ψt

Species of the 11 plots were classified and graphed on the basis of maximum observed rooting depth and minimum (i.e. most negative) morning Ψt values. Rooting depths were divided into three categories (0-20, 20-60, and >60 cm) as were morning Ψt values (0 to -0.5, -0.5 to -1.5, and >-1.5 MPa). The first Ψt division included those species which are capable of nocturnally regaining or maintaining high Ψt values despite environmental conditions. In contrast, species in the third category could not recover overnight from previous moisture deficits and must tolerate further water losses. Species in the middle category had intermediate responses. The three depth categories represent different positions in the soil: near-surface organic and/or mineral substrates, middle and lower solum. Plants can be separated into 9 categories based on these two variables. This approach represents an extension of work by Waring (1969) who used Ψt as an indicator of moisture stress in community interpretations.

Figure 13 graphically summarizes the relationship between minimum Ψt values and rooting depth. *Alnus, Pinus, Rosa, Arctostaphylos*, and *Abies* were the deepest rooted species in the Jack Pine/Sand Series. *Alnus* had the highest (i.e. least stressed) morning Ψt values and *Arctostaphylos* had the lowest Ψt values of the deeply rooted species. *Picea glauca* and *Viburnum edule* were rooted in the middle solum and had minimum morning Ψt values which fell between -0.75 and -1.5 MPa. The lowest Ψt values in the Jack Pine/Sand Series were observed for a number of shallowly rooted ericaceous and/or evergreen species: *Pyrola asarifolia, Vaccinium myrtilloides*, and *V. vitis-idaea*. The lowest values were recorded on open-canopied plots (e.g., 1 and 2).

The Aspen/Sand Series had more extreme Ψt values than the Jack Pine/Sand Series (Figure 13). *Pyrola asarifolia, Cornus canadensis*, and *V. vitis-idaea* were the most severely depressed with *Pyrola* reaching -3.1 MPa. These and other shallowly rooted plants such as *Rubus pubescens, V. myrtilloides*, and *Linnaea borealis* had Ψt values in the -1.5 to -2.2 MPa range. *Amelanchier* was rooted to 37 cm in Plot 9 and had a morning Ψt minimum of *ca*. -2.0 MPa. Species in the deep-rooted group tended to have Ψt values similar to those in the Jack Pine/Sand Series. *Alnus* was more stressed on the Aspen/Sand sites than Jack Pine/Sand sites, despite its deep rooting on both.

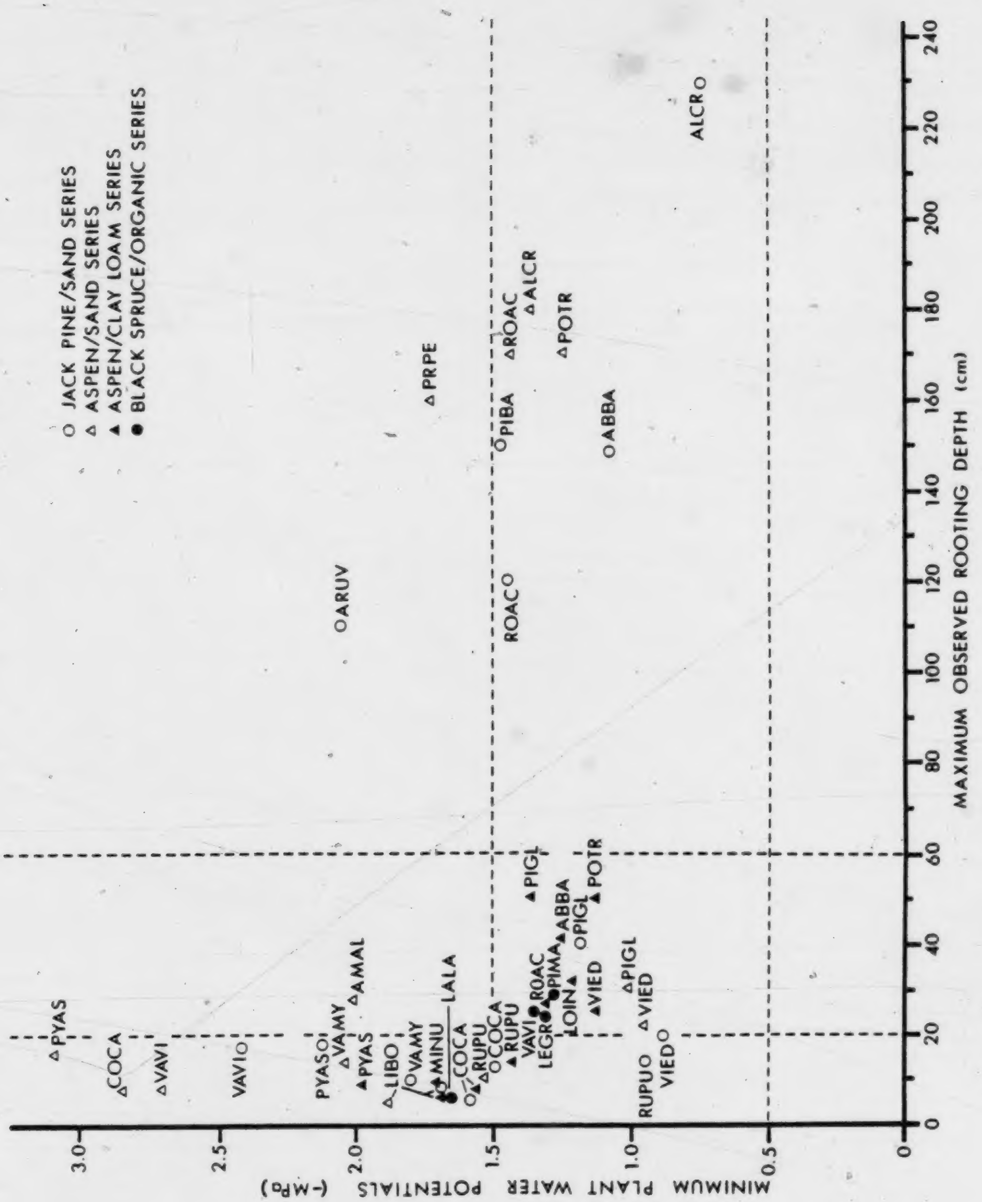


Figure 13. Summary of Minimum Plant Water Potentials and Maximum Observed Rooting Depth.

On the Aspen/Clay loam Series shallow-rooted species such as *Pyrola asarifolia*, *Mitella nuda*, *Linnaea borealis*, *Rubus pubescens*, and *Cornus canadensis* had minimum Ψt values which ranged from -1.0 to -2.0 MPa. *P. glauca*, *Abies*, *Lonicera involucrata*, and *Viburnum* were rooted in the 20-60 cm depth range, and had Ψt morning extremes between -1.0 and -1.5 MPa. When these species occurred in both the Sand and Clay loam Series, they were usually positioned close to each other in Figure 8.

Plants of the Black Spruce Series had Ψt values amongst those of the Jack Pine and Aspen Series (Figure 13). *Picea mariana*, *V. vitis-idaea*, and *Ledum* had Ψt extremes comparable to those of *Picea glauca*. *Larix* had Ψt values comparable to those of *V. myrtilloides*, *Cornus canadensis*, *Linnaea borealis* on the Jack Pine/Sand Series. No species were found in any Series within the 0 to -0.5 MPa Ψt category at any depth. Rooting depths were limited to the upper 40 and 60 cm of the Black Spruce and Aspen/Clay loam Series, respectively, due to restrictions in the soil.

Soil Matrix Potential (Ψm)

Soil moisture was usually most abundant below 60 cm and above 30 cm in mineral soils. This pattern of moisture distribution was disrupted by the June moisture deficit which reduced Ψm values below -1.5 MPa near ground level and sometimes at depth (Figures 8b and 9a). The duration of this deficit ranged from 5-6 weeks for Plot 2 to <2 weeks for Plot 4. July precipitation partially recharged soil moisture, particularly in the upper 30 cm of the solum. Ψm values in the 30 to 60 cm depth range were usually <-1.5 MPa from late-May to September.

In the Black Spruce/Organic Series, Ψm values were between 0 and -0.1 MPa below the water table level throughout the summer (zero cm depth line in Figure 9). Plot 7 had a progressive moisture decrease in the upper 25 cm of the soil profile until late June and remained between -0.5 and -1.5 MPa during July and August. Moisture availability in Plot 8 was low during May due to the frozen ground, but was more available from June through August.

All plots received similar precipitation amounts during the latter half of summer, but the effective amounts were not identical. For instance, precipitation had little effect on surface (0-30 cm depth) Ψm values of Plot 2, although Ψm values below 60 cm increased from <-0.5 to >-0.1 MPa, while Ψm values remained below -1.5 MPa between 30 and 60 cm. On the Aspen/Clay Loam Series, precipitation resulted in the recharging of the entire soil profile.

Soil water-holding capacity was greatest near the ground surface and decreased with increasing depth from *ca.* 15 to 6% by volume in the Jack Pine and Aspen/Sand Series, probably as a result of decreasing organic matter content. In contrast, the sandy loam overlay of the Aspen/Clay Loam Series had a water-holding capacity of *ca.* 25%; whereas the morainal deposits were <15%. The thick moss carpets of Plots 3,4,6, and 8 and organic litter of other plots had a greater capacity than the mineral soil. Values for these substrates ranged from 36-59% for mosses to 27-32% for deciduous leaf litter.

Plant Ψt Correlations

Moving average plant Ψt values were regressed and correlated against four moisture variables (3 soil depths (Ψm) and precipitation amounts) in an attempt to identify moisture sources used by plants. It is to be expected that about 14 of the 288 partial coefficients (r) of the multiple correlation in the Table 11 will be statistically significant at the 0.05 probability level even if the null hypothesis were true, but in fact, 57 coefficients were significant at that level. An additional 20 coefficients were significant at the 0.10 probability level. Approximately half of all significant coefficients were negative. Sixty percent of the 72 multiple correlations were significant at $P<0.05$ level.

Seven species were significantly and primarily correlated with precipitation values: *Linnaea borealis* (Plot

Table 11. Partial (r) and Multiple (R) Correlations of Plant Water Potentials with Precipitation (mm) and Soil Water Potentials at Three Depths.

Plot	Species		Maximum Rooting Depth (cm)	Precip- itation	DEPTH (cm) 7-10	30	70	
				r	r	r	r	R
Jack Pine/Sand Series								
1	Arctostaphylos uva-ursi	ARUV	135	0.10	0.18	0.40*	0.21	0.82**
	Pinus banksiana	PIBA	129	0.05	0.31	0.13	-0.61**	0.69**
	Rosa acicularis	ROAC	120	-0.13	0.37	-0.31	0.36	0.64+
	Vaccinium myrtilloides	VAMY	10	0.18	0.49*	-0.23	0.08	0.85**
	Vaccinium vitis-idaea	VAVI	5	0.15	0.13	0.29	0.46*	0.78**
2	Alnus crispa	ALCR	230	-0.12	0.04	-	0.11	0.26
	Arctostaphylos uva-ursi		110	-0.12	0.19	-	0.42*	0.61*
	Pinus banksiana		150	0.27	0.30	-	0.17	0.47
	Rosa acicularis		140	-0.10	0.31	-	0.20	0.60*
	Vaccinium myrtilloides		10	-0.19	0.39+	-	0.25	0.71**
	Vaccinium vitis-idaea		17	-0.21	0.29	-	0.46*	0.71**
3	Alnus crispa		150	-0.18	0.42+	-	-0.03	0.57+
	Cornus canadensis	COCA	13	-0.18	0.24	0.21	0.09	0.51
	Pinus banksiana		150	0.03	0.39+	-	0.21+	0.62*
	Picea glauca	PIGL	30	0.12	0.34	0.31	0.14	0.62*
	Pyrola asarifolia	PYAS	18	-0.36+	0.01	-	0.20	0.50+
	Rosa acicularis		30	-0.12	0.26	-	0.14	0.50

Table 11. *Continued.*

Plot	Species		Maximum Rooting Depth (cm)	Precip-itation	DEPTH (cm)			
					7-10	30	70	
				r	r	r	r	R
	Rubus pubsecens	RUPU	14	-0.01	0.07	-	0.29	0.44
	Vaccinium myrtilloides		15	-0.22	0.19	-	0.40+	0.67*
	Vaccinium vitis-idaea		9	-0.25	0.26	0.16	0.10	0.54
4	Abies balsamea	ABBA	150	0.16	0.60**	-0.30	0.42	0.65*
	Cornus canadensis		9	-0.23	-0.16	0.11	0.28	0.38
	Linnaea borealis	LIBO	9	-0.25	0.65**	-0.08	0.09	0.77**
	Picea glauca		39	0.00	0.47*	0.12	0.48*	0.67**
	Viburnum edule	VIED	20	0.09	0.51*	-	-0.33	0.52
Aspen/Clay Loam Series								
5	Cornus canadensis		8	-0.39+	-0.49*	0.28	-0.37+	0.66*
	Linnaea borealis		6	-0.60**	-0.50*	0.60**	0.21	0.72**
	Lonicera involucrata	LOIN	32	-0.44*	-0.30	0.73**	-0.49*	0.80**
	Mitella nuda	MINU	9	-0.35	-0.31	0.38	0.31	0.55
	Picea glauca		50	0.09	0.05	0.26	-0.06	0.44
	Pyrola asarifolia		9	-0.51*	-0.49*	0.73**	0.05	0.79**
	Rosa acicularis		27	-0.48*	-0.71**	0.75**	0.42+	0.81**
	Rubus pubescens		14	-0.62**	-0.48*	0.56**	0.11	0.75**
	Viburnum edule		25	-0.15	-0.06	0.34	-0.58**	0.64*

Table 11. *Continued.*

Plot	Species		Maximum Rooting Depth (cm)	Precip- itation	DEPTH (cm) 7-10	30	70	
				r	r	r	r	R
6	Abies balsamea		40	-0.13	0.24	0.05	-0.40*	0.69**
	Cornus canadensis		8	-0.39+	-0.12	0.06	-0.36+	0.56+
	Linnaea borealis		6	-0.23	0.09	-0.02	-0.34	0.49
	Lonicera involucrata		32	-0.10	0.16	0.35	-0.35	0.72**
	Mitella nuda		9	-0.41+	-0.09	0.35	-0.17	0.66*
	Picea glauca		50	-0.25	-0.11	0.31	-0.01	0.51
	Pyrola asarifolia		9	-0.35	0.11	0.13	-0.08	0.51
	Rubus pubescens		14	0.07	-0.41+	0.34	-0.19	0.52
	Viburnum edule		25	0.23	0.19	0.06	-0.50*	0.68*
Aspen/Sand Series								
10	Alnus crispa		102	-0.46+	0.09	0.38	0.25	0.53
	Cornus canadensis		10	-0.10	-0.38*	-0.17	-0.49*	0.66*
	Linnaea borealis		6	-0.25	0.41*	-0.57**	-0.46*	0.75**
	Populus tremuloides	POTR	170	-0.30	-0.11	0.36	0.20	0.41
	Prunus pensylvanica	PRPE	179	-0.50*	0.36	-0.23	-0.06	0.61*
	Pyrola asarifolia		16	-0.17	-0.11	-0.17	-0.32	0.53
	Rosa acicularis		90	-0.09	-0.11	-0.58**	-0.49*	0.77**
	Rubus pubescens		22	-0.54**	0.51*	0.33	-0.21	0.71*

Table 11. *Continued*.

Plot	Species		Maximum Rooting Depth (cm)	Precip-itation	DEPTH (cm) 7-10	30	70	
				r	r	r	r	R
	Vaccinium myrtilloides		13	-0.08	0.15	-0.53*	-0.57**	0.74**
	Vaccinium vitis-idaea		17	-0.24	0.44*	-0.35	-0.66**	0.76**
	Viburnum edule		28	-0.17	-0.23	0.25	-0.14	0.36
9	Alnus crispa		105	-0.22	0.47+	0.22	0.65**	0.77**
	Amelanchier alnifolia	AMAL	27	-0.22	-0.32	-0.08	0.54*	0.70*
	Cornus canadensis		8	0.01	-0.25	0.10	0.35	0.36
	Linnaea borealis		5	-0.09	0.21	-0.11	0.39+	0.64*
	Picea glauca		40	-0.07	0.06	-0.11	0.55**	0.71**
	Prunus pensylvanica		250	-0.13	-0.17	-0.19	0.60**	0.72
	Pyrola asarifolia		13	-0.20	-0.48*	-0.54**	0.71**	0.86**
	Rosa acicularis		170	-0.27	-0.20	-0.16	0.60**	0.74**
	Rubus pubescens		10	-0.00	0.06	-0.23	0.00	0.25
	Vaccinium myrtilloides		15	-0.19	-0.04	-0.17	0.22	0.45
	Vaccinium vitis-idaea		6	-0.20	-0.37+	-0.37+	0.69**	0.81**
	Viburnum edule		21	-0.07	0.62**	0.15	-0.13	0.72**

Table 11. *Concluded.*

Plot	Species		Maximum Rooting Depth (cm)	Precip-itation	DEPTH (cm) 7-10	30	70	
				r	r	r	r	R
Black Spruce/Organic Series								
7	Larix laricina	LALA	7	0.07	0.31	-0.01	-	0.68**
	Ledum groenlandicum	LEGR	27	-0.16	0.68**	0.38+	-	0.81**
	Picea mariana	PIMA	27	-0.06	0.44*	0.03	-	0.76**
8	Ledum groenlandicum		27	-0.33	-0.42*	0.08	-	0.47
	Picea mariana		27	-0.19	-0.39+	0.12	-	0.40
	Vaccinium vitis-idaea		26	-0.34	-0.19	-0.09	-	0.36

Levels of Significance + = 10%, * = 5%, ** = 1%

5), *Mitella nuda* (6), *Pyrola asarifolia* (3,5,6), *Cornus canadensis* (5,6), *Alnus crispa* (10), *Rubus pubescens* (5,10), and and *Prunus pensylvanica* (10). These species had mostly shallow root systems (<20 cm) primarily located in the surface organic horizons of mineral soils; exceptions were *Prunus* and *Alnus* which extended roots to 180 cm.

In total, 10 of the 72 possible Ψt-Ψm pairs at 7-10 cm depth values were significantly correlated. Within this group were shallow-rooted species such as *Vaccinium myrtilloides* (Plot 1,2), *V. vitis-idaea* (4,10), *Linnaea borealis* (4,10), *Ledum groenlandicum* (7,8), and *Picea mariana* (7,8); and more deeply rooted species such as *Alnus crispa* (Plot 3), *Pinus banksiana* (3), and *Abies balsamea* (4). Most of these species (73%) occurred mainly on sandy soils; 20% were associated with aspen plots.

Three species were significantly correlated with Ψm values at 30 cm depth: *Arctostaphylos uva-ursi* (Plot 1,2), *Rosa acicularis* (5), and *Lonicera involucrata* (5). *Alnus crispa* (Plot 9), *Arctostaphylos uva-ursi* (2), *Amelanchier alnifolia* (9), *Prunus penslvanica* (9), *Rosa acicularis* (9), *Picea glauca* (4,9), *Pyrola asarifolia* (9), *Vaccinium vitis-idaea* (1,2,9) and *V. myrtilloides* (3), and *Linnaea borealis* (9) were primarily and directly correlated with Ψm at 70 cm depth. However, the last 4 species do not normally root below 30 cm. Numerous species had partial correlation coefficients which were inversely related (e.g., *Pinus banksiana* (Plot 1)) to Ψm values at 70 cm.

DISCUSSION

The correction technique we used to estimate plant water potentials (Ψt) at 0700 hrs MST from measurements made between 0600 and 1300 hrs MST on the same day (See Methods) is based on the assumption that transpiration rates are relatively constant under similar conditions throughout the summer. It is well known that transpiration rates are influenced by soil Ψm (Yang and de Jong 1971), ambient air temperature and humidity, wind speed, and solar radiation intensity (Larcher 1975). More recent work has shown that transpiration rates also vary with leaf age in otherwise identical environments (Korner *et al*. 1979). Mean leaf age per plant certainly increases throughout the summer in the 21 species we measured. Some of the measured +Ψt values of early summer (e.g., *Arctostaphylos uva-ursi* in Figure 8a, *Ledum groenlandicum* and *Larix laricina* in Figure 10b) may be in some cases associated with the flushing and expansion of new leaves; or, a false xylem pressure potential reading due to abundant apoplastic plant water and/or an over-correction of Ψt values during periods of abundant soil moisture.

It is likely that some of the observed variations in plant Ψt are caused by variations among and within individual plants (Hellkvist *et al*. 1974). This sampling problem arises because the same plant sample could not be re-measured throughout the summer. Zobel *et al*. (1976, p. 143) have suggested, however, that this practice "appears to contribute no systematic error to the data". The use of a moving three-point average Ψt for graphic and interpretation purposes seems to have reduced the possible 'noise' imparted by measurements time and sampling error to an acceptable level, allowing comparison of seasonal Ψt trends of individual species and stands.

If the correction technique can be improved by implementing leaf-age related corrections, it may become useful for comparative analyses of water use by plant communities subjected to different environmental treatments.

Boreal forest stands in central Alberta are probably moister than many alpine (Oberbauer and Billings 1981, Ehleringer and Miller 1975) and arctic tundra communities (Tieszen *et al*. 1981), but drier than the wet tundra communities of northern Alaska (Stoner and Miller 1975). Furthermore, no boreal species approached the strongly negative morning water potentials (*ca.* -4.5 MPa) measured for *Artemisia* and *Arctostaphylos* species in the chaparral vegetation of southern California (Poole and Miller 1975).

Our *Pinus*, *Abies*, and *Picea* specimens were not subjected to moisture deficits as severe as those measured for *Quercus* or *Carya* in central Missouri (Parker *et al*. 1982). Zobel *et al*. (1976) reported minimum Ψt values for *Abies*, *Thuja*, and *Tsuga* in the Pacific Northwest that are comparable to those measured for boreal forest trees in Alberta. Summer Ψt minima for *Alnus crispa* subspecies *sinuata* in northern Idaho (Cline and Campbell 1976) were usually lower (more negative) than those of *A. crispa* measured in this study. Understory species such as *Cornus canadensis*, *Linnaea borealis*, and *Pyrola asarifolia* had Ψt minima similar to those measured by other researchers (Waring 1969, Zobel *et al*. 1976).

While the Ψt response patterns described in Results (Figures 8 - 13) are probably unique to the summer of 1982, they are undoubtedly typical of many summers in the region. The uniqueness stems from the magnitude and spacing of precipitation events. For example, the months of May and June were considerably drier (30 mm) than normal, whereas July and August received *ca*. 50 mm more precipitation than would normally be expected (Anonymous 1982a,b).

Despite the common view that *Pinus*, *Populus*, and *Picea mariana* communities occupy distinct but overlapping positions along a moisture gradient in the Boreal Forest Region (e.g., Kabzems *et al*. 1976, Strong and Leggat 1981), they had similar summer Ψt patterns in our study area.

Pinus banksiana and *Populus tremuloides* stands growing on sand had the greatest fluctuations in Ψt values.

Ψt values were highest at the beginning of summer. A progressive decline in Ψt and Ψm values occurred throughout May and June. In many cases Ψm values were lower than -1.5 MPa by early June. When early summer moisture became available in the 20-60 cm depth range of the soil, it too was depleted by early June, except in the Black Spruce Series. Water at a comparable depth in the Black Spruce Series was probably unavailable to the plants due to the paucity of roots at this depth. The greatest divergence in Ψt values among species occurred during late June when moisture availability was lowest. Ψt values moderated in July when precipitation increased. However, Ψt pattern divergence recurred when precipitation and soil moisture declined in late July and August.

All low Ψt values may not be a result of low Ψm. For example, the early June depression of *Pyrola asarifolia* (Plot 10) may result from abnormally high solar radiation at ground level, which is attributable to forest tent caterpillar (*Malacosoma disstria* Hbn.) defoliation of the *Populus tremuloides* canopy. The *Populus tremuloides* trees of Plots 9 and 10 were not significantly affected by caterpiller. After *Populus* produced a second leaf cohort, *Pyrola* Ψt values became considerably less negative. In contrast, the high Ψt for *Alnus crispa* on Plot 3 may be attributable to the partial (2/3 reduction) defoliation of the species. Such reduction in leaf area would have reduced the quantity of water transpired relative to a fully leafed condition, thus improving its water budget.

Soil moisture was usually most plentiful above 20 cm and below 60 cm throughout the summer of 1982. However, moisture below 60 cm was not available to most species, particularly those of the Aspen/Clay Loam and Black Spruce Series, due to rooting depth restrictions. Surface organic matter is a very effective interceptor of and reservoir for precipitation. Percolation losses of intercepted water to lower soil horizons occurred only when the water-holding capacity of the organic matter was exceeded. Precipitation >50 mm would be required to raise Ψm values in the upper 30 cm of the soil to field capacity (-0.03 MPa), assuming the initial Ψm value is -1.5 MPa, runoff did not occur, no interception by vegetation, and mineral and associated organic (10 cm thick) horizons had water-holding capacities of 10 and 30% by volume, respectively. In general, therefore, water percolates through the soil profile of the studied stands during summer only after heavy or repeated light rains. During 1982 only 3 events yielded rainfall amounts >30 mm. This may in part explain why roots are most concentrated in the LFH horizon or near-surface mineral soil horizons when organic layers are absent.[3]

Four broad ecological groups of vascular plants can be recognized within the 11 boreal forest stands. The first group is composed of shallow-rooted, low-growing, mostly evergreen species which can tolerate low (<-1.5 MPa) Ψt values. *Pyrola asarifolia, Vaccinium vitis-idaea, V. myrtilloides, Linnaea borealis, Cornus canadensis*, and *Mitella nuda* belong to this group. These species occurred on a variety of substrates and sites.

Rubus pubescens may belong to this group but is an exception in terms of both Ψt response and morphology. This perennial herb had minimum Ψt values equal to or less negative than -1.5 MPa. In addition, its Ψt values were not correlated with soil Ψm at 7-10 cm depth, suggesting that *Rubus* may have better control over transpiration, vascular conductivity, or water use efficiency than other shallow-rooted species.

Shallow rooting could be an advantage to forest understory vascular plants. Moisture is usually most available in the upper 2 dm of the ground surface due to low regional precipitation and the relatively high water-holding capacity of the LFH and Ae horizons. These combined factors limit downward soil percolation. However, shallow-rooting also has disadvantages. Firstly, the upper portion of the solum has the highest density of roots (Strong and La Roi 1983a), thus intensive competition for moisture. Secondly, moisture availability is extremely variable during the growing season and directly dependent upon precipitation.

---

[3] Nutrients are also an important factor, and will be considered in subsequent work (Strong and La Roi 1984b).

The second ecological group of plants has maximum rooting depths to 60 cm with minimum Ψt values in the -0.5 to -1.5 MPa range. Within this group are *Viburnum edule*, *Rosa acicularis*, *Populus tremuloides* (fine-textured soils), *Picea glauca*, *Abies balsamea* (till sites only), *Lonicera involucrata*, *Picea mariana*, and *Ledum groenlandicum*. From an edaphic perspective, deeper rooting permits exploitation of water resources from a larger volume of soil. Only when soil moisture is unavailable near the ground surface, e.g., from light precipitation, does deep-rooting offer an advantage other than mechanical support. Otherwise, the most suitable rooting depth would be below the zone of extreme moisture fluctuation, but close enough to the ground surface to utilize some near-surface water.

It is notable that *Picea mariana* had Ψt minima similar to those of species commonly found on mesic upland sites. This suggests that *P. mariana* is less able to control transpiration losses than *P. glauca*, and thus is restricted to subhygric or hygric sites in the Boreal Mixedwood Ecoregion. However, where less severe climatic moisture deficits occur, due to lower summer temperatures and/or increased precipitation (the Boreal Foothills and Upland Ecoregions of western Alberta (Strong and Leggat (1981)), *P. mariana* can occupy upland sites as a sub- and co-dominant with *P. glauca*.

Abies balsamea and *P. glauca* appear to have similar below-ground niches on the Aspen/Clay loam sites. Although *Abies* had somewhat higher summer Ψt values than *P. glauca*, neither species appears to have a distinctive advantage below-ground. In combination with their shade-tolerant characteristics, these two species appear to be evenly matched climax trees. Many of the species belonging to the second group are components of late-successional and subclimax communities.

Plants in the third ecological group have rooting depths >60 cm, Ψt values between -0.5 and -1.5 MPa, and grow on deep sand deposits. *Rosa acicularis*, *Alnus crispa*, *Populus tremuloides*, *Abies balsamea*, and *Pinus banksiana* are members of this group. The Ψt values of these species were not consistently correlated with soil Ψm data, although deep and/or spreading root systems represent adaptations for survival of xerophytes under stressful moisture conditions.

The fourth ecological group is represented by *Arctostaphylos uva-ursi* and *Prunus pensylvanica*. These species have deep root systems (>60 cm) on sandy soils, yet they experience Ψt values lower than -1.5 MPa. Both species have deep root systems which appear inadequate in meeting the water demands of the transpiring leaves. The limited number of deep sinker roots relative to the plant's leaf area suggests that moisture absorption is primarily from the upper portion of the soil (<60 cm), where smaller roots are more abundant. The deeper roots may have a survival function during periods of extreme drought.

Vertical below-ground separation was very evident among the plant species investigated. This mechanism of resource partitioning reduces the degree of root system overlap, thus increasing the compatability of coexisting species. This phenomenon is not unlike the classic examples described for warblers in the northeastern United States (MacArthur 1958), birds in tropical rain forests (Diamond 1973), or Australian desert lizards (Pianka 1969). Partitioning among plants have been recognized below-ground in several non-forest ecosystems. For example, Mueller-Dombois and Sims (1966) and Brendse (1981) observed the vertical and horizontal separation of grass roots under artifical growing conditions, while Grace and Wetzel (1982) identified similar separations between *Typha* species according to water depth. Wieland and Bazzaz (1975) found differences in the rooting depths of codominant old-field plants, while Parrish and Bazzaz (1976) recognized a higher degree of niche overlap in old-field communities as compared to prairie vegetation.

Weaver (1968) has also shown that grassland species have individualistic rooting patterns and depths. The timing of biological activities, differential nutrient demands (Parrish and Bazzaz 1982), and physiological adaptations (Roberts *et al.* 1979, Parker *et al.* 1982) both above- and below-ground are additional dimensions for niche partitioning which have been postulated. It seems reasonable to expect similar niche partitioning mechanisms among boreal plants which successfully coexist.

Combined with different water absorptive capabilities and controls over transpiration rates, below-ground niche separation should explain some of the individualistic responses of various species to varying moisture supplies. Intraspecific variation in Ψt response patterns may be attributed to variations in rooting substrate. For example, *Vaccinium vitis-idaea* and *V. myrtilloides* grew in mineral substrates in *Pinus/Arctostaphylos* stands, but rooted in the LFH layer in the *Pinus/Pleurozium* stands. Such individualistic responses by plants may partially explain the low correspondence between species and site conditions found by Carlton (1982) in Ontario jack pine stands. In addition, adaptation to substrate conditions through differential rooting may partially explain the apparent tolerance of some species to a wide range of site conditions (e.g., *Vaccinium vitis-idaea* occupied sites that ranged from xeric to hygric) and the overlapping distribution of species along moisture gradients (e.g., Whittaker 1975, p. 115).

Subclimax stands (4,6,8) had species Ψt values which were more synchronized (i.e. parallel, harmonious) than younger seral stands (Figures 8b,9b,10c). Such synchrony supports the hypothesis of Bormann and Likens (1979) that climax ecosystems have better self-regulated nutrient (water and cation) flows than seral ecosystems. The development of a thick moss carpet and/or organic soil surface layer may be an important mechanism for regulating nutrient losses in old-growth stands in central Alberta. This control may be an adaptive response to the interception of water by the LFH layer, minimal evaporation from the ground surface and reduced soil temperatures due to shading from a multi-storied stands, and the development of roots within the LFH layers. However, the lower percentage of species in significant Ψt-Ψm correlations of subclimax relative to seral communities suggests that subclimax communities may be more limited by environmental factors other then moisture availability, most probably by nutrients.

In summary, succession tends to favor those species which are tolerant of both severe soil moisture fluctuations and shading in the boreal forest.

CHAPTER IV

ROOT DENSITY - SOIL RELATIONSHIPS IN SELECTED BOREAL FORESTS OF CENTRAL ALBERTA, CANADA[1]

ABSTRACT

Soil pits located in boreal aspen (*Populus tremuloides* Michx.), jack pine (*Pinus banksiana* Lamb.), and white spruce (*Picea glauca* (Moench) Voss) stands were analyzed by horizon for nutrients (Ca, Mg, PO_4-P, K, Na, SO_4-S, NH_4-N, NO_3-N), physical properties (horizon depth; silt, clay, and organic content; bulk density; water-holding capacity), and root densities. Two aspen and three jack pine stands were located on aeolian sands with Eutric Brunisolic soils, while two additional aspen stands occurred on clay loam morainal deposits with Gray Luvisolic soils. A subclimax white spruce stand occurred on both parent materials. Stand ages ranged from 19 to 170 years in age. This study assessed the relationships of root location and density to the above-mentioned edaphic factors. The highest concentration of roots was at the organic/mineral soil interface. Correlation and Principal Components Analysis (PCA) sugggested that root densities are negatively correlated with depth, clay content, and bulk density; and positively correlated with soil water-holding capacity and extractable

---

[1] Submitted to the For. Ecol. Manage. in August 1984.

PO_4. Insufficent Phosphorus appears to be an important growth-limiting factor in the study area. PCA ordinations of edaphic variables consistently revealed a cluster of correlated variables composed of organic matter, NH_4, NO_3, and sometimes K content, but none of these was consistently associated with root distributions. Aspen communities appear to be more dependent upon N and other organically bound nutrients than coniferous stands.

INTRODUCTION

In many forested regions of the world, edaphic and disturbance factors account for much of the mosaic patterning of forest communities found under a given macroclimate. The importance of edaphic conditions and resources as factors controlling the distribution and productivity of boreal forest ecosystems has become increasingly evident in recent years (Persson 1980; Van Cleve and Dyrness 1983). Forest site-, habitat-, and ecosystem-type classifications (e.g., Cajander 1926; Krajina 1965; and Franklin and Dyrness 1973), and forest ordinations (e.g., Whittaker 1956; Bray and Curtis 1957) are examples of methods developed to elucidate and utilize vegetation-edaphic relationships. Despite these efforts, the relationships between vegetation and edaphic conditions have only been implied because plant root systems were not an intrinsic part of the analyses. The soil-root-decomposer subsystem of edaphic relationships is an exceedingly complex component of forest ecosystems due to the multitude of chemical, biological, and physical variables which can interact below-ground. Our understanding of this subsystem is further impeded by spatial as well as by vertical substrate heterogeneity and differential rooting depths of individual species (Strong and La Roi 1983a,b). If root positions indicate where essential nutrients are absorbed (St. John 1983), then root system analyses are critical to the understanding and management of plant community-edaphic relationships.

The objectives of this paper are to (1) describe selected edaphic characteristics of 9 boreal forest stands, (2) interpret the possible ecological significance of these characteristics using Principal Components Analysis (PCA) and correlation, and (3) identify below-ground successional trends associated with these communities.

STUDY AREA

The study area is located in the Boreal Mixedwood Ecoregion (Strong and Leggat 1981) 55 km southeast of Lesser Slave Lake in central Alberta. The climate, site conditions, and vegetation have been described by La Roi and

Ostafichuk (1984) and Strong and La Roi (1983a,b). Briefly, aspen (*Populus tremuloides* Michx.), jack pine (*Pinus banksiana* Lamb.), and white spruce (*Picea glauca* (Moench) Voss) (Moss 1959) forests occur on Eutric Brunisolic (Anonymous 1978) soils developed on well-drained aeolian sand deposits; while aspen and white spruce forests also occur on moderately-well drained Gray Luvisolic soils developed on clay-rich till deposits. The topography is gently rolling throughout the area. Aeolian deposits in the form of rolling plains and sand dunes dominate the southern portion of the study area, while morainal deposits occur in the northern sector.

The nine plots used in this study are thought to represent three successional sequences (Strong and La Roi 1983a): Jack Pine/Sand, Aspen/Sand, and Aspen/Clay Loam Series. The Jack Pine Series consisted of four stands: two *Pinus/Arctostaphylos/Cladina* (40 and 60 years old), one *Pinus/Alnus/Aralia/Pleurozium* (85 years old); and one *Picea-Abies/Hylocomium* (170 years old) stand (Plots 1-4, respectively).

The Aspen/Sand Series was composed of three stands; Plot 4 represents the subclimax stand of both the Aspen/Sand and Jack Pine/Sand Series, and was used as such. Aspen dominated the overstory vegetation of two *Populus/Alnus-Prunus/Aralia* (Plots 10 and 9) stands (40 and 79 years old, respectively). White spruce occurred in the tall herb layer (1-3 dm) of Plot 10, but was sporadic as a subdominant in Plot 9.

The Aspen/Clay Loam Series was composed of three stands: a *Populus/Calamagrostis/Aralia*; a *Populus-Picea/Viburnum/Aralia*; and a *Picea-Populus/Viburnum/Aralia* (19, 72, and 115 years old) stand (Plots 11, 5, and 6, respectively). The feathermosses *Pleurozium schreberi* (Brid.) Mitt. and *Hylocomium splendens* (Hedw.) B.S.G. had 30% cover in Plot 6. This stand was considered to represent the subclimax stage of the Aspen/Clay Loam successional sequence.

METHODS

Field Procedures

Within each stand a 20x50 m plot was subjectively located and staked into forty 5x5 m subplots. Seven subplots were chosen at random for detailed sampling. A pit was dug in the center of each subplot to >1.25 m, then pedologically described.

After description, one wall of the pit was smoothed with a knife and washed with a low-pressure water sprayer to expose root ends for easier counting. Roots on the prepared pit wall were enumerated in a counting frame 1.25 m high and 0.2 m wide, which was composed of horizontal cells, 2.5x5 cm. This sampling design was similar to that described by Bohm (1979). By placing the counting matrix vertically against the pit face, it was possible to determine the number of roots in each cell as the soil profile was descended. Roots were separated into five diameter classes (<0.075, 0.075-1, 1-2, 2-5, and >5 mm); however, this analysis relied on the summation of the two smaller diameter classes which contained >95% of the total number of roots. No attempt was made to separate individual species. Root densities by horizon surface (roots/dm^2) were estimated by grouping rows of cells.

Bulk soil samples of known volume were taken from each horizon, air-dried, and sealed in plastic bags. Samples for estimating water-holding capacity were collected in copper rings (5.2 cm I.D. by 2.5 cm deep) by horizon, sealed in plastic bags, and refrigerated at *ca.* 3°C until processed. All samples were collected from late June to early August.

Laboratory Procedures

Three pits in each plot were selected for detailed analysis. Selection was based on lack of major soil profile anomalies and sufficient sample to complete all analyses.

Extractable P in the form of PO_4 was determined by the "medium strength" Bray method. S in the form of SO_4 was extracted with a 0.1M $CaCl_2$ solution. P and S concentrations were measured by colorimetry (Technicon II Auto-analyzer). Available Ca, Mg, Na, and K were extracted with NH_4OAc (pH 7) using a 1:5 ratio of soil to solution, while Total Exchange Capacity (TEC) was estimated with a 1:25 ratio. Cation concentrations were determined by atomic absorption (PYE Unicam SP1950).

Soil pH was determined by immersing 10 g mineral or *ca.* 5 cm^3 organic soil in 50 ml 0.01M $CaCl_2$ solution. Measurements were made with a Corning glass electrode meter.

Texture of the <2 mm mineral soil fraction was determined by the pipette method, based on 20 or 40 g samples, depending upon whether fine- or coarse-textured, respectively. Samples were decarbonated with HCl and wet oxidized with H_2O_2 to remove organic constituents.

Percent organic matter was determined by the Walkley-Black wet oxidation method. All previously mentioned soil analyses follow procedures described by McKeague (1976).

Available water-holding capacity for mineral soil horizons was estimated at -0.01 and -1.5 MPa using a ceramic plates extractor. Prior to processing the undisturbed soil samples were masked on the lower surface with fine-mesh nylon cloth and soaked in distilled water for +24 hours (McKeague 1976). After equilibration at the above water potentials, samples were dried at 105°C for 48 hours.

Water-holding capacity of organic horizons was estimated by soaking fresh samples in water for 24 hours, draining for ca. one hour, weighing, drying (105°C), and reweighing. Capacities was expressed in percent by volume.

The quantity of NH_4 and NO_3 (measured as nitrogen) potentially mineralized (Smith *et al.* 1981) in the soil during summer was estimated by anaerobic decomposition. This analysis was modelled after work by Powers (1980). Samples for incubation were taken from the <2 mm fraction of bulk samples (A and B horizons), and fresh litter (LFH) samples collected in late September, 1982, after leaf-fall. Litter samples were stored in the dark at 3°C until processing.

Litter samples were prepared for incubation by chopping with a razor blade and then were divided into two subsamples. One subsample (*ca.* 0.5 cm^3) was weighed and added to a 16x150 mm test tube with 12.5 ml of water, while the other was weighed, oven dried at 105°C, and reweighed to determine water content. Three incubated samples were prepared for each plots. Organic particles were maintained in a submerged state with a fiberglass plug placed just below the air-water interface. Five grams of soil were used for mineral horizons. Tubes were sealed with rubber stoppers and dark-incubated for 21 days at 18°C (Plot 4), 22°C (Plots 3,5,6,9,11), and 28.6°C (Plot 1,2,10). These temperatures over a 21 day period represent half the average number of heat units (i.e. degree-days >0°C) available for decomposition in the various stands (values ranged from ca. 600 in Plot 4 to 1700 degree-days in Plot 1) and horizons during the summer. Incubation temperatures were estimated by measuring temperatures at 4-day intervals at 30 cm above-, and 10 and 30 cm below-ground in each stand from early May to September, 1982.

After incubation samples were leached with 2N KCl to a total volume of 50 ml. NH_4 and NO_3 concentrations were measured with an auto-analyzer. All nutrient analysis results are reported on a dry weight basis (µg/g).

Multivariate and Statistical Procedures

All soil nutrient and physical properties were converted to either density units or percentage values to facilitate Principal Components Analysis (PCA). Only those horizons having root densities >0 were included. A correlation matrix rather than the typical variance-covariance matrix was used due to mixed units of measure (Isebrands and Crow 1975). The intent of PCA was to graphically portray the soil variables for easier description and hypothesis generation. This was accomplished by plotting the eigenvalues of the first (x-axis) and second (y-axis) components of each soil variable. Product-moment correlation coefficients between edaphic variables and root density ($\log_{10}$) were then plotted on the ordination. Both PCA and correlation analyses were performed with Michigan Interactive Data Analysis System programs (Fox and Guire 1976).

RESULTS

Soil Profile Descriptions

Soils in the Jack Pine/Sand Series were classified as Orthic and Eluviated Eutric Brunisols. The former was more common in the tree canopy openings of Plots 1 and 2, whereas Eluviated soils occurred beneath trees. LFH horizons had an average thickness of 2.4 cm. Thin discontinuous Ah or Aej horizons occurred in the uppermost portion of Orthic profiles. Eluviated subgroups had Aej horizons <6 cm thick, underlain by 1, and sometimes 2, brown (10YR 5/3 dry) to pale brown (10YR 6/3 dry) Bm horizons which extended to an average depth of 39, 52, and 73 cm in Plots 1, 2, and 3, respectively. $CaCO_3$ enriched the aeolian parent materials (Ck) below 90 cm giving a distinctive increase in pH relative to the overlying horizons (Table 12). Roots seldom occurred in the LFH, but consistently exceeded 100/dm^2 in the zone immediate below.

Soils of the Aspen/Sand Series (Plots 9 and 10) were classified as Eluviated Eutric Brunisols. The LFH horizon was dominated by deciduous leaf litter in various stages of

Table 12. Means and Standard Deviations of Soil Nutrient and Physical Characteristics by Successional Grouping

Horizon	No. Sam- ples	EXTRACTABLE NH_4-N	NO_3-N	PO_4-P	SO_4-S	Ca	Mg	Na	K	TEC[a] MEQ/ 100 g	Mean Depth (cm)	Roots /dm'	pH	Bulk Density g/cm'	Org- anic %	Silt[c] %	Clay %	Water- Holding Capacity (g/100cm' X 100)
		µg/g																
Jack Pine/Sand Series (Plots 1, 2, and 3)																		
LFH	9	221	62	32	14	911	126	8	232	-[b]	-1.2	5	4.5	0.06	80	0	0	17
		(268)[d]	(55)	(16)	(6)	(326)	(47)	(2)	(83)		(0.4)	(13)		(0.02)	(22)	(0)	(0)	6
Ahj	3	20	3	58	2	885	68	7	71	-	2.5	200	6.4	1.00	4	6	3	14
		(21)	(2)	(36)	(1)	(444)	(22)	(<1)	(28)		(1.3)	(80)		(0.18)	(3)	(<1)	(2)	(3)
Aej	4	19	3	46	2	525	57	5	68	5.5	3.8	142	5.8	1.07	3	8	4	14
		(17)	(2)	(18)	(8)	(262)	(32)	(1)	(45)		(3.5)	(78)		(0.27)	(3)	(2)	(1)	(3)
Bm1	9	10	5	75	0	455	63	7	49	4.7	21.1	83	6.1	1.45	<1	6	4	7
		(13)	(2)	(22)	(0)	(96)	(11)	(1)	(20)		(7.8)	(46)		(0.07)	(<1)	(3)	(2)	(2)
Bm2	4	3	1	31	0	876	125	9	66	6.0	46.9	30	6.6	1.50	-	3	3	7
		(-)	(-)	(12)	(0)	(218)	(41)	(2)	(20)		(10.8)	(17)		(0.03)	(-)	(1)	(2)	(3)
C	9	-	-	47	0	793	86	8	42	4.6	75.5	8	6.9	1.50	-	3	3	6
		(-)	(-)	(9)	(0)	(297)	(22)	(2)	(13)		(13.6)	(7)		(0.05)	(-)	(1)	(1)	(3)
Ck	7	-	-	3	0	2127	60	6	27	4.0	-	2	8.6	1.51	-	3	9	6
		(-)	(-)	(2)	(0)	(105)	(15)	(4)	(7)		(-)	(3)		(0.06)	(-)	(2)	(5)	(2)
Aspen/Sand Series (Plots 10 and 9)																		
LFH	6	901	109	77	17	2521	375	8	389	-	-2.8	217	4.9	0.09	88	0	0	32
		(898)	(138)	(19)	(4)	(779)	(112)	(3)	(54)		(0.9)	(89)		(0.02)	(9)	(0)	(0)	(14)
Aej	6	20	4	72	2	564	87	8	53	27.1	4.0	170	4.7	1.05	3	7	4	11
		(18)	(2)	(24)	(1)	(202)	(12)	(2)	(16)		(1.2)	(80)		(0.17)	(3)	(1)	(1)	(1)
Bm1	6	2	4	45	0	787	126	10	68	6.2	25.2	63	5.8	1.42	<1	5	5	9
		(1)	(1)	(12)	(0)	(251)	(66)	(4)	(17)		(8.8)	(34)		(0.06)	(0.3)	(2)	(<1)	(2)
Bm2/Btj	6	-	-	21	0	1075	149	9	59	45.6	63.8	19	6.4	1.48	-	4	5	8
		(-)	(-)	(15)	(0)	(194)	(18)	(2)	(17)		(14.6)	(30)		(0.03)	(-)	(1)	(2)	(2)
C	2	-	-	22	0	1078	146	11	60	5.6	90.3	40	6.3	1.49	-	4	5	8
		(-)	(-)	(13)	(0)	(70)	(42)	(3)	(7)		(7.4)	(2.8)		(0.05)	(-)	(<1)	(1)	(2)
Ck	6	-	-	1	0	2429	98	9	44	6.6	-	8	8.2	1.46	-	4	3	7
		(-)	(-)	(0.5)	(0)	(311)	(23)	(4)	(15)		(-)	(10)		(0.03)	(-)	(1)	(1)	(3)

Table 12. *Continued.*

Horizon	No. Samples	EXTRACTABLE								TEC MEQ/ 100 g	Mean Depth (cm)	Roots /dm'	pH	Bulk Density g/cm'	Organic %	Silt %	Clay %	Water Holding Capacity (g/100 cm')
		NH_4-N	NO_3-N	PO_4-P	SO_4-S	Ca	Mg	Na	K									
		µg/g																
Subclimax Spruce-fir Stand of Jack Pine- and Aspen/Sand Series (Plot 4)																		
LFH	3	271	63	44	17	2064	112	8	272	-	-4.2	71	5.3	0.08	91	0	0	59
		(293)	(52)	(6)	(5)	(140)	(10)	(0.5)	(76)		(0.8)	(9)		(0.04)	(8)	(0)	(0)	(-)
Ae	2	13	5	29	1	462	85	11	52	14.7	4.5	118	4.9	1.03	2	11	5	16
		(7)	(<1)	(10)	(1)	(129)	(34)	(1)	(6)		(1.4)	(15)		(0.12)	(1)	(3.6)	(2.1)	(1)
Aej	1	21	6	67	3	765	138	7	161	-	3.0	79	5.7	0.95	2	13	5	16
		(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)		(-)	(-)		(-)	(-)	(-)	(-)	(-)
Bm	3	25	5	59	0	811	149	12	97	13.0	15.2	81	5.4	1.21	<1	13	5	15
		(1)	(2)	(37)	(0)	(186)	(27)	(4)	(55)		(3.7)	(32)		(0.08)	(0.2)	(3.6)	(3.4)	(3)
Bm2/Btj	2	-	-	7	0	1436	245	13	132	-	42.8	22	5.9	1.31	-	12	7	13
		(-)	(-)	(1.4)	(0)	(45)	(24)	(0.1)	(81)		(4.6)	(0.2)		(0.01)	(-)	(6.1)	(4)	(4)
Bt	1	-	-	3	0	1771	272	16	74	11.1	34.0	43	5.9	1.44	-	7	8	10
		(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)		(-)	(-)		(-)	(-)	(-)	(-)	(-)
C	3	-	-	15	0	1642	244	20	72	10.7	89.0	9	6.1	1.37	-	5	6	13
		(-)	(-)	(8)	(0)	(55)	(18)	(2)	(13)		(9.4)	(6)		(0.02)	(-)	(1.5)	(3.5)	(1)
Ck	2	-	-	2	0	3024	162	13	59	8.8	-	2	8.6	1.33	-	7	7	9
		(-)	(-)	(0.7)	(0)	(40)	(20)	(4)	(15)		(-)	(2)		(0.10)	(-)	(0.1)	(0.4)	(2)
Aspen/Clay Loam Series (Plots 11 and 5)																		
LFH	6	202	56	90	19	2923	379	9	470	-	-4.1	236	6.0	0.08	79	0	0	27
		(138)	(53)	(15)	(2)	(456)	(79)	(3)	(103)		(2.2)	(62)		(0.03)	(14)	(0)	(0)	(7)
IAe	6	24	4	33	<1	1047	180	9	125	41.4	6.1	105	5.6	1.36	2	27	9	26
		(17)	(4)	(35)	(0.1)	(265)	(26)	(2)	(64)		(2.9)	(45)		(0.17)	(2)	(2)	(3)	(4)
IAB	4	14	13	26	0	815	171	10	88	5.0	15.6	53	5.6	1.54	<1	30	7	22
		(6)	(18)	(40)	(0)	(247)	(23)	(3)	(54)		(2.9)	(31)		(0.10)	(0.4)	(5)	(2)	(6)
IIBt(gj)	6	-	-	5	0	2109	642	22	145	23.7	33.8	23	5.2	1.56	-	22	17	13
		(-)	(-)	(6)	(0)	(330)	(208)	(7)	(18)		(4.3)	(11)		(0.06)	(-)	(7)	(11)	(6)
IIBC	1	-	-	11	0	2359	937	28	167	21.6	-	2	6.0	1.59	-	23	30	8
		(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)		(-)	(-)		(-)	(-)	(-)	(-)	(-)
IIC(gj)	5	-	-	7	0	2420	709	31	134	21.6	-	6	5.6	1.66	-	20	17	9
		(-)	(-)	(9)	(0)	(634)	(248)	(11)	(20)		(-)	(3)		(0.05)	(-)	(11)	(4)	(3)

Table 12. *Concluded.*

Horizon	No. Samples	EXTRACTABLE								TEC MEQ/ 100 g	Mean Depth (cm)	Roots /dm'	pH	Bulk Density g/cm'	Organic %	Silt %	Clay %	Water Holding Capacity (g/100 cm')
		NH_4-N	NO_3-N	PO_4-P	SO_4-S	Ca	Mg	Na	K									
		µg/g																
Subclimax White Spruce Stand of Aspen/Clay Loam Series (Plot 6).																		
LFH	3	221	450	47	11	2606	243	10	272	-	-6.2	128	6.3	0.07	83	0	0	36
		(205)	(622)	(-)	(2)	(845)	(104)	(3)	(57)		(2.0)	(37)		(0.01)	(15)	(0)	(0)	(-)
IAe	3	8	4	35	1	838	138	13	86	11.1	6.3	103	5.8	1.30	1	31	5	23
		(3)	(4)	(7)	(1)	(48)	(39)	(3)	(23)		(1.9)	(41)		(0.16)	(<1)	(8)	(3)	(2)
IAB	2	17	7	19	1	885	139	12	89	7.2	15.3	26	6.4	1.53	<1	32	5	20
		(0)	(0)	(4)	(2)	(9)	(1)	(4)	(9)		(1.8)	(6)		(0.03)	(0.2)	(8)	(4)	(8)
IIBt	3	4	2	5	0	2234	612	17	187	34.0	29.8	18	6.5	1.62	<1	35	8	8
		(-)	(-)	(4)	(0)	(914)	(274)	(4)	(69)		(0.8)	(12)		(0.06)	(0.2)	(15)	(4)	(1)
IIBC	3	-	-	3	0	2820	908	22	219	23.6	-	5	6.4	1.67	-	35	13	10
		(-)	(-)	(1)	(0)	(157)	(86)	(3)	(51)		(-)	(4)		(0.04)	(-)	(14)	(17)	(2)

---

[a] Only one TEC estimate was made for each horizon.
[b] Dashes indicate no data.
[c] Silt size equals 0.05 to 0.002 mm.
[d] Brackets indicate standard deviation of mean.

decomposition with an average thickness of 5.5 cm. Beneath the LFH were Aej, Bm1, Bm2 or Btj, and Ck horizons. Aej horizons were continuous and averaged 8 cm in thickness. The B horizons were similar to those of the Pine Series, except the lower horizons had weak evidence of clay illuviation in the form of structure development and textural changes. The lower portion of the B horizons occurred at approximately 80 cm. Root density was highest in the LFH and declined with depth.

Soils in Plot 4 were classified as Eluviated Eutric Brunisols and Brunisolic Gray Luvisols. The LFH layer averaged 8.3 cm in thickness and was primarily composed of *Hylocomium splendens* and secondarily of *Picea* and *Abies* detritus. The profile morphology was similar to that of the Aspen/Sand Series and Plot 3, except some pedons had better developed Bt or Bm2 horizons. The degree of Bt development was the principal distinction between the two subgroups. The average lower limit of the B horizon occurred at 63 cm. Root density was highest in the surface mineral horizons (Table 12).

Aeolian deposits of both the Jack Pine- and Aspen/Sand Series had clay + silt contents of <12%. Pine stands had a higher silt content than the Aspen stands, whereas clay content was 1% higher in the Aspen soils. The highest silt + clay content (18%) in the two series was found in Plot 4.

The water-holding capacity of mineral soil horizons ranged from 6 to 16% by volume; the higher values were found in surface horizons. LFH horizons had water-holding capacities 2 to 3X greater than those of mineral soil horizons (Table 12).

Minimum nitrogen (NH_4 + NO_3) concentrations were 280, 1010, and 330 μg/g (0.02, 0.07, and 0.02 moles/kg soil, respectively) for jack pine, aspen, and spruce-fir stands on sand, respectively (Table 12). SO_4-S concentrations were <18 μg/g (<0.0006 moles/kg) throughout the soil profile. K had maximum values of 390 μg/g (0.01 moles/kg) in the Aspen/Sand Series and minimum values of 230 μg/g (0.006 moles/kg) in the Jack Pine/Sand Series. PO_4-P concentrations seldom exceeded 80 μg/g (0.003 moles/kg). N, SO_4, and K were most abundant in the LFH horizon. Ca was bimodally concentrated in the LFH and Ck horizons, with values between 2000 and 3000 μg/g (0.05 and 0..07 moles/kg), except in the LFH horizons of the Jack Pine/Sand Series, where values averaged 910 μg/g (0.02 moles/kg). Mg content ranged from 60 to 130 μg/g (0.002 to 0.005 moles/kg) in the Jack Pine/Sand Series and from 80 to 380 μg/g (0.003 to 0.02 moles/kg) in the Aspen/Sand and Spruce-fir stands.

Soils of the Aspen/Clay Loam Series were classified as Orthic and Gleyed Gray Luvisols. These soil subgroups were composed of 5 and sometimes 6 horizons. The LFH horizons of Plot 5 and 11 averaged 8.1 cm in thickness and were composed of deciduous leaf and herb litter. On Plot 6 the LFH horizon was mainly composed of *Pleurozium schreberi* and patches of deciduous leaf litter both averaging 12 cm in thickness. An eluviated (Ae) horizon with a with a distinctive gray (10YR 7/1 dry) color and platy structure occurred below the LFH horizons in all three stands. Below the Ae occurred a transitional horizon (AB) with an average thickness of 14.3 cm. Both the Ae and AB horizons occurred in the sandy-textured outwash which overlaid morainal materials. Imperfectly drained Bt pedons had granular structure and mottles. Better drained pedons had a blocky structured BC horizon. Root densities were greatest in the LFH horizons and declined with depth.

Pedons in Plot 6 were similar to those of Plot 5 and 11, except for the lack of Gleyed subgroups and the consistent occurrence of BC horizons.

NH_4, NO_3, and SO_4 were most abundant in the LFH horizon in the Aspen/Clay Loam Series, whereas Na and Mg were most abundant in lower horizons (Table 12). Maximum SO_4-S concentrations were <20 µg/g (<0.001 moles/kg). Ca concentrations exceeded 2000 µg/g in all horizons, except in the Ae and AB horizons where it seldom reached 1000 µg/g (0.02 moles/kg). K was similarly distributed but its availability was only 10% that of Ca. PO_4-P occurred throughout the soil profile in quantities <40 µg/g (0.001 moles/kg).

Soil bulk density was greatest at depth and ranged from 1.38 to 1.67 g/cm³. Surface mineral horizons had bulk densities <1.4 g/cm³, whereas LFH horizons were <0.1 g/cm³. Water-holding capacities ranged from 8 to 36% by volume with highest values in surface horizons (LFH, Ae, and AB). Soil pH values ranged from 5.6 to 6.5, with Ae horizons having the lower values. Organic matter was concentrated at the ground surface and occurred only in the upper 15 cm of the mineral soil in quantities >2%.

Total exchange capacity (TEC) was highly variable. In the Sand Series and the outwash portion of the Luvisolic soils profile, TEC decreased with increasing depth. TEC was usually highest in the till portions in the Aspen/Clay Loam Series.

PCA and Correlation of Soil Variables

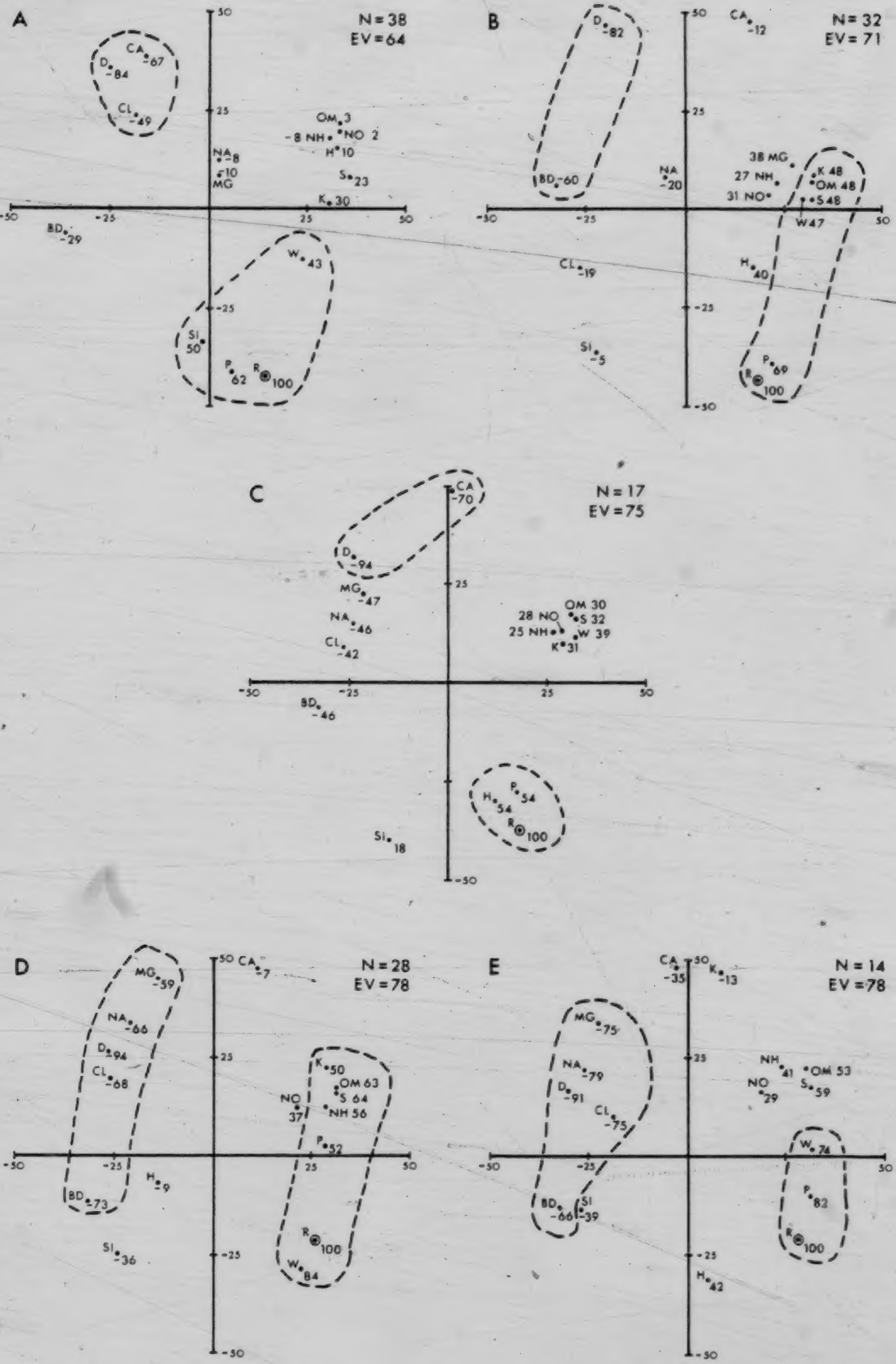
To evaluate possible changes in conditions with increasing stand age, plots were grouped into either seral (Plots 1,2,3; 10,9; 11,5) or subclimax (Plots 4; 6) categories. Stand age and successional status as reflected by species composition were the criteria used for grouping.

Three general groupings of variables can be detected in seral stands of the Jack Pine/Sand Series (Figure 14A). The first group consists of three variables: water-holding capacity, percent silt, and PO_4; these variables were positively correlated ($P<0.01$) with roots/dm^2; PO_4 was most strongly correlated (+0.62). The second group is composed of Ca, percent clay, and depth; these variables were negatively correlated with root density; horizon depth was strongly correlated (-0.84) with root density. A third group includes variables which were not significantly correlated with root density; within this grouping there is a distinctive cluster of intercorrelated variables: H-ion, organic matter, NO_3, NH_4, SO_4, and K content. The negatively and positively correlated variables occur in the upper left and lower right quadrants of the ordination diagram, respectively, while the variables uncorrelated with root density occupy an intermediate position.

In seral stands of the Aspen/Sand Series (Figure 14B), PO_4 was again the variable having the strongest correlation with roots/dm^2 ($r=+0.69$). Four other variables, SO_4, water-holding capacity, organic content, and K were strongly correlated ($P<0.01$) with root density. These variables formed a discrete cluster with NO_3, NH_4, H-ion, and Mg content. H-ion and Mg content were moderately correlated ($P<0.01$) with root density. Horizon depth and bulk density had strong negative correlations with root density, while Ca, Na, clay, and silt content were uncorrelated.

In subclimax Plot 4, PO_4 and H-ion content were positively correlated, while horizon depth and Ca content were negatively correlated with roots/dm^2 at the $P<0.05$

Figure 14. PCA and product-moment correlation coefficients (r x 100) of soil properties by successional grouping: A - Seral Jack Pine/Sand; B - Seral Aspen/Sand; C - Subclimax White Spruce-Fir/Sand; D - Seral Aspen/Clay Loam; and E - Subclimax White Spruce/Clay Loam. Dots represent the location of soil variables based on eigenvalues from the first (x-axis) and second (y-axis) components of the PCA. Numerical values represent simple correlation coefficients, i.e., $\log_{10}$ root density (⊙) verses NH, NO, D, etc. See Table 13 for symbol names. Dashed lines enclose correlation coefficients significant at the $P<0.05$ (Figures c,e) and $P<0.01$ (Figures a,b,d) levels. N = Number of soil horizons used in each analysis. EV = Percent explained variance of the PCA.


A
N = 38
EV = 64
CA -67
D -84
CL -49
OM 3
-8 NH
NO 2
H 10
NA -8
-10
MG
S 23
K 30
BD -29
W 43
SI 50
P 62
R 100
B
N = 32
EV = 71
D -82
CA -12
BD -60
NA -20
38 MG
27 NH
31 NO
K 48
OM 48
S 48
W 47
CL -19
H 40
SI -5
P 69
R 100
C
N = 17
EV = 75
CA -70
D -94
MG -47
NA -46
CL -42
BD -46
28 NO
OM 30
S 32
25 NH
W 39
K 31
H 54
P 54
R 100
SI 18
D
N = 28
EV = 78
CA -7
MG -59
NA -66
D -94
CL -68
BD -73
H -9
SI -36
K 50
OM 63
S 64
NO 37
NH 56
P 52
R 100
W 84
E
N = 14
EV = 78
CA -35
K -13
MG -75
NA -79
D -91
CL -75
BD -66
SI -39
NH 41
OM 53
NO 29
S 59
W 74
P 82
R 100
H 42
50
25
-25
-50
-50
-25
25
50

level (Figure 14C). The two negatively correlated variables had a higher degree of variance explanation (r^2) than either of the positively correlated variables. The remaining variables were uncorrelated with root density; among them there is a distinctive cluster of positive coefficients composed of organic matter, NH_4, NO_3, SO_4, K, and water-holding capacity; these variables were all significantly correlated with each other.

In seral stands of the Aspen/Clay Loam Series six variables had positive correlations ($P<0.01$) with roots/dm^2 (Figure 14D); of these, water-holding capacity was located nearest the root density in the ordination, four variables (NH_4, SO_4, K, organic matter) were clustered at the opposite end of the 1% probability grouping, and PO_4 was located between the two loci extremes.

Mg, Na, clay, bulk density, and horizon depth were negatively correlated with roots/dm^2; their r^2 values ranged from 35 (Mg) to 88% (depth). Ca, H-ion, silt, and NO_3 content were not significantly correlated with root density.

In Plot 6, the subclimax stand of the Aspen/Clay Loam Series, PO_4 and water-holding capacity were positively correlated ($P<0.05$) with root density (Figure 14E). PO_4 was closer to and more strongly correlated with root density than was water-holding capacity. Variables negatively correlated with root density included Mg, Na, depth, clay, and bulk density; the remaining independent variables were uncorrelated.

In general, variables which were negatively correlated with root density were associated with the lower portions of the soil profile, whereas positive coefficients were associated with the upper portions. The first two component axes of each of the five PCA ordinations accounted for from 64 to 78% of the observed variance. The Jack Pine/Sand Series had the lowest proportion of explained variance. Table 13 summarizes the correlation between root density and the various edaphic variables by plot groupings. Each of these variables was either uncorrelated or unidirectionally correlated with root density (e.g., 4 positive and 1 uncorrelated case), except silt content. PO_4, NO_3, and horizon depth had exclusively positive, neutral, and negative correlation values, respectively. H-ion and NH_4 content were uncorrelated, while water-holding capacity was positively correlated in 4 of the 5 plant community groupings.

DISCUSSION

In all 9 boreal forest stands, the highest concentration of roots was in the lower portion of the LFH layer or immediately below (Table 12). Similar results have been found by other researchers in a variety of forest ecosystems (Kimmins and Hawkes 1978, p. 269). Such root distribution patterns are probably adaptive not coincidental, since the main source of recyclable nutrients, warmest soil temperatures, best aeration, and, in many cases, the most available water and highest water-holding capacities occur just below the ground surface. In combination, these conditions would promote maximum litter decomposition and greatest nutrient release relative to other positions in the soil. Extractable NH_4-N, NO_3-N, SO_4-S, PO_4-P, and K all attained their highest concentrations in the near-surface soil horizons.

Other soil variables (e.g., Ca, Mg and clay content, depth and bulk density) were negatively associated with root densities. Of these, only clay content and bulk density could be considered to have a direct, negative effect upon root development by mechanically restricting downward root penetration (Table 13). Bulk density increases with increasing depth and an increase in clay content in the Aspen/Clay Loam Series. Ca in the form of $CaCO_3$ occurred at depth in Jack Pine/Sand and Aspen/Sand stands possibly due to leaching. The higher concentration of Mg in the B and C horizons of the Aspen/Clay Loam Series is probably related to the parent material mineralology rather than pedogenic processes.

Table 13. Summary of Correlations ($\log_{10}$ Root Density vs y-variables) by Sign and Successional Grouping.

Variable Name (y-variables)	Symbol	Seral Jack Pine/Sand (Plots 1,2,3)	Subclimax Spruce-fir (Plot 4)	Seral Aspen/ Sand (Plots 10,9)	Seral Aspen/ Clay Loam (Plots 11,5)	Subclimax White Spruce (Plot 6)
Ammonium (NH_4^+ - N)	NH	0	0	0	+	0
Bulk Density	BD	0	0	-	-	-
Calcium	CA	-	-	0	0	0
Clay	CL	-	0	0	-	-
Horizon Depth[a]	D	-	-	-	-	-
Hydrogen Ions[b]	H	0	+	0	0	0
Magnesium	MG	0	0	0	-	-
Nitrate (NO_3^- - N)	NO	0	0	0	0	0
Organic Matter	OM	0	0	+	+	0
Phosphorus (PO_4 - P)	P	+	+	+	+	+
Potassium	K	0	0	+	+	0
Silt	SI	+	0	0	0	-
Sodium	NA	0	0	0	-	-
Sulfur (SO_4^{2-} - S)	S	0	0	+	+	0
Potassium	K	0	0	+	+	0
Water-holding Capacity	W	+	0	+	+	+

+ = Positive Correlation (P<0.05), 0 = Not Correlated, - = Negative Correlation (P<0.05)

---

[a] Horizon Depth is defined as the median horizon depth divided by total profile depth.
[b] Variable represents pH converted to hydrogen ion concentration.

PO_4 was the only measured variable which consistently had a strong positive correlation with root density (Figure 14). This close linkage suggests that the relationship between roots and PO_4 content is biologically significant. Hence, it is postulated that, of the measured edaphic variables, PO_4 is the primary factor limiting growth which may ultimately limit productivity of upland forests in the study area.

Similar conclusions have been reached by other researchers in other ecosystems. For example, Sidle and Shaw (1983) suspected P deficiencies in clearcut western hemlock-Sitka spruce (*Tsuga heterophylla* (Raf.) Sarg.) - *Picea sitchensis* (Bong.) Carr.) stands, but their hypothesis was not tested. Chapin *et al.* (1983) tested the effect of P on several Alaskan tree seedling species and found a positive correlation between P and deciduous tree growth response, although field fertilization trials of deciduous forest stands resulted in a response to N rather than P (Van Cleve *et al.* 1983). In tundra ecosystems of the Canadian High Arctic, Nosko (1984) found P to be more limiting to growth than N. In their review of C, N, S, and P cycling, McGill and Cole (1982, p. 283) proposed a conceptual model in which P is "the ultimate control on organic matter cycling and accumulation". A summary of nutrient requirements for tree seedlings (Ballard 1980) indicates that the soils of the study area contain less than half the

PO_4 needed for optimal tree growth, whereas other ions were in sufficient supply. Fertilization trials should be conducted in our boreal forest stands to test the PO_4 deficiency hypothesis.

From an ecosystem development (Odum 1969) or successional perspective, the location of roots close to the chief source of recyclable nutrients is potentially important for three reasons. First, the likelihood of nutrient interception and preemption by other species is reduced. Second, nutrient losses from the ecosystem by leaching could be reduced if roots were immediately available for absorption. Third, the accumulation of organic matter with increasing stand age could produce an efficient mechanism for regulating the recycling of nutrients due to the synchronization of water supply, decreased soil temperature, decomposer activities, nutrient release, and nutrient absorption by roots, particularly if mycorrhizal associations are involved in litter mineralization.

This third possible mechanism for regulating the flow of nutrients in boreal forest ecosystems resembles that proposed for northern hardwood forests by Bormann and Likens (1979), which postulates that plant communities are increasingly able to regulate their nutrient budgets with increasing age. Fahey (1983) drew similar conclusions in his studies of lodgepole pine (*Pinus contorta* Loudon) stands in Wyoming. However, the LFH layers in the two cited studies were mainly composed of broad- and needle-leaves, respectively, while those in late-successional boreal forest stands are mainly composed of bryophytes.

Age-specific changes in the floristic composition and above-ground physiognomy of boreal forest stands appear to be associated with important changes below-ground. This is well illustrated by stands in the Aspen/Sand and -Clay Loam Series where root density is positively correlated with organic content and its associated variables in seral stands (Figures 14B and D) but not in the jack pine or white spruce stands (Figures 14C and E). Such changes in the relationships of below-ground variables probably result from the dramatic "environmental metamorphosis" (Daubenmire, 1968) caused by the replacement of aspen by white spruce. This suggests that white spruce are either less nutrient-demanding or they have more efficient mechanisms for nutrient absorption than aspen. Experimental work by Parrish and Bazzaz (1982) with herbaceous plants along a nutrient gradient tends to support the hypothesis that climax species are less nutrient-demanding than seral species.

In conclusion, the ordinations and correlations in this study demonstrate that (1) the upper 25 cm of the soil profile is of primary importance in upland boreal forests of central Alberta, (2) data from deeper soil horizons may be required only on rapidly drained sites where deep-rooting occurs (Table 9) (Strong and La Roi 1983b), and (3) analyses of root systems of individual plants and communities could provide information that is important to the understanding of plant community-edaphic relationships. Attempts to evaluate such relationships exclusively from data on above-ground plant components and soils cannot possibly provide equivalent insight. However, the latter approach may be less handicapped if the researcher has some knowledge of the distribution and abundance of roots in the soil and collects more biologically relevant soils data.

CHAPTER VI

INTEGRATION

HYPOTHESES

During the early stages of this research three testable hypotheses were developed to focus attention on the relationship between plant community development and root distribution patterns.

Hypothesis 1 (*The root distribution pattern of boreal forest communities is related to seral stage as based on stand age*) is supported by the results of this research, except on sites which had significant rooting restrictions such as a high water level or fine-textured substrates (Chapter 2). It was found that rooting depth increased with stand age on sandy textured soils, possibly as a result of increased site exploitation and niche separation. Hypothesis 1 may still be proven true on fine-textured soils, if homogeneous (e.g., lacustrine deposits) substrates could be tested. Sites with well developed Ae and Bt horizons, and/or parent material discontinuities such as those associated with the Aspen/Clay Loam Series should be avoided due to their heterogeneous nature and potential differential effects on root penetration. Unfortunately, such homogeneous substrate conditions may be difficult to find in the Boreal Mixedwood Ecoregion.

Hypothesis 2 (*The distribution and development of upland forest communities is primarily correlated with soil moisture availability*) proved only partially true and difficult to test based on the approach used in this study. Black spruce, aspen, and jack pine communities were distributed along a moisture gradient from hygric to semi-xeric conditions, respectively. However, the development of these stands was also influenced by microclimate, site conditions, nutrient availability, species tolerance characteristics, and successional trends (Chapters 4 and 5). Soil moisture has an important role in the development of forest communities, but it is difficult to conclude that it was the primary control based on the available data. If soil moisture and the other variables functioned independently, rather then in an integrated, holistic manner, it might be possible to identify the most important variable.

Hypothesis 3 (*Boreal Mixedwood understory plants primarily extract soil moisture from the upper (e.g., 60 cm) portion of the rooting zone on both organic and mineral soils*) appears to be true for most understory plants, based on plant rooting depths and soil/plant water potential correlations (Chapter 4). Exceptions occurred on sandy textured soils where plants such as *Alnus*, *Prunus*, and *Rosa* were deeply rooted (>1 m). These plants may obtain a significant portion of their water supply from depths below

60 cm, but this requires additional testing. The rooting depths of understory plants were less than initially anticipated and commonly concentrated in the LFH horizons of the soil. Most over- and understory species were rooted within 20 cm of the forest floor (Chapter 3).

ROOTING DEPTHS ON A GLOBAL BASIS

A general review of published literature was conducted in an attempt to evaluate the rooting patterns of upland boreal communities in the study area in comparison to those of other major ecosystems. Due to the lack of standardized methods of presenting rooting data, it was necessary to intepret the results in each article to derive a common characteristic for comparing various ecosystems. The zone of fine-root (<2 mm) concentration was considered the most meaningful because it generally represents the zone of nutrient and water absorption.

Based on the data presented in Table 14, there appears to be a relationship between rooting depth and the type of ecosystem, i.e., an increase in rooting depth occurs with increasing climatic aridity. For instance, high precipitation areas (>1500 mm/year) such as tropical rainforests tend to have a very narrow zone (4-10 cm) of fine-roots. Less humid mid-latitude ecosystems have a

Table 14. Rooting Depths of Global Ecosystems Arranged Along a Gradient from Humid Tropical to Xeric Desert Vegetation.

Ecosystem	Approximate Thickness of Fine-root Zone (m)	Common Maximum Rooting Depth (m)	Source
Tropical Forest			
Rainforest (Brazil)	0.04-0.10	-	St. John (1983)
Forest (Costa Rica)	0.05	+1.0	Berish (1982)
Pacific Coast Forest			
(Canada - British Columbia)	0.15	1.4	Eis (1974)
Temperate Beech Forest (Germany)	0.20	0.6	Meyer and Gottsche (1971)
Boreal Forests			
Sub-boreal White Spruce Zone (Canada - British Columbia)	0.08-0.20	0.8	Kimmins and Hawks (1978)
Scots Pine (Central Sweden)	0.15	-	Persson (1980b)
Aspen and Jack Pine (Canada - Alberta)	0.20	1.3	Present Study
Tundra (Canada - High Arctic)	0.15-0.20	<0.60	Muc (1977)
Alpine (USA - Wyoming)	0.25	0.60	Daubenmire (1941)
Mixed Prairie (USA and Canada)			
Grass Forbs	0.30 0.45	1.4 2.4	Weaver and Albertson (1956) and Coupland and Johnston (1965)
Savanna (South Africa)	0.60	1.5	Rutherford (1983)
Chaparral (USA - California)	0.60-1.5	1.5-8.0	Hellmers *et al*. (1955)
Desert (Eygpt)	2.00	12.0	Batanouny and Abdel Wahab (1973)

fine-root zone approximately twice as thick as tropical forests; while those of grasslands, xerophytic shrubs, and desert ecosystems are several times thicker (Table 14). These latter ecosystems have the deepest overall rooting depths (e.g., 8-12 m).

A general shift in the location of fine-roots occur along a gradient from moist tropical to desert vegetation. Fine-roots are primarily concentrated in the litter layers of tropical soil, while chaparral and desert plants are rooted almost exclusively in the mineral soil. Intermediate ecosystems occupy both the litter and uppermost mineral soil horizons.

Boreal forest communities in the Hondo-Lesser Slave Lake area occupy a position between temperate beech forests (Meyer and Gottsche 1971) and semi-xeric grassland vegetation (Weaver and Albertson 1956) along the climatic aridity gradient presented in Table 14. Fine-roots were concentrated within the upper 20 cm of the rooting zone which was composed of both litter and mineral soil horizons. These characteristics are similar to those of White Spruce-Subalpine Fir communities of British Columbia (Kimmins and Hawks 1978) and Scots Pine stands of central Sweden (Persson 1980), despite their widely separated geographical locations.

Why rooting depth changes with environmental aridity is not entirely clear, but it may be a response to limiting factors imposed either directly or indirectly by climatic conditions. For example, moist rainforest vegetation is obviously less limited by soil moisture availability than by nutrients. St. John (1983) suggests that these shallow-rooted ecosystems are oriented towards the absorption of nutrients from rapidly decomposing forest litter. Rapid decomposition occurs when soil temperatures are high and soil moisture is plentiful. On the other hand, chaparral and desert vegetation are directly limited by the availability of soil moisture which results from low annual precipitation and high potential evapotranspiration rates. Many desert plants have very deep root systems for extracting moisture from deep within the soil. In contrast, other desert plants have broad, shallow root systems composed of very fine roots for collecting moisture when precipitation is limited. Mid-latitude forests have rooting depths intermediate to these extremes.

Upland boreal forests are probably shallow-rooted due to three factors: soil moisture, nutrient limitations, and soil temperatures. Such limitations may be a response to the distribution of moisture and nutrients within the soil and their interdependence in the litter decomposition process. Soil moisture availability may itself promote shallow-rooting. For example, Weaver and Albertson (1956) observed a ca. 50% reduction in rooting depths of grasslands in North American Great Plains at the end of the 1930's drought. Their observations suggest that shallow-rooting was an advantage when reduced precipitation resulted in less downward percolation of soil moisture. A similar situation occurs in boreal forests when soil litter retains precipitation due to its high water-holding capacity and limits downward percolation. Soil temperatures may contribute to shallow-rooting by promoting maximum nutrient turnover near the ground surface where temperatures are most favorable. Ultimately, these conditions are a response to the climatic regime of the area.

SUCCESSIONAL TRENDS IN THE BOREAL FOREST

Root systems and rhizomes appear to play an important role in plant community succession. For example, the re-establishment of a forest stand following natural disturbance (e.g., fire) can result from the regeneration of many vascular plants from below-ground plant components (Rowe 1979). Approximately 80% of the commonly occurring plants in the study plots possessed rhizomes, while others are able to regenerate from a root stock (e.g., *Alnus*). As a result the new stand is strongly influenced by the reservoir of below-ground plant organs from the previous stand. This is analogous to the concept of a "seed-bank" *sensu* Harper (1977).

Generally, roots appear to play an active role in succession. Rooting depth slowly increases with increasing stand age on sites lacking significant restrictions to rooting depth. Roots are primarily located in the upper portion of the mineral soil during early succession; however, the buildup of litter tends to promote the invasion of roots into the LFH layers. During the mid to late stages of succession, white spruce and/or balsam fir trees invade, slowly changing the microclimatic and other conditions of the stand. Evergreen conifers increase the degree of shading which in turn promotes the development of shade-tolerant species, suppresses shade-intolerant species, lowers the temperature, and changes the nutrient cycling regime of the stand. These changes can result in a reduction in near-surface rooting density due to a reduction in vascular plant diversity. In addition, some plants experience a change in their above- and below-ground biomass ratios, i.e., the proportion of below-ground biomass increases relative to the above-ground shoot. Such plants develop deformed and much stockier below-ground systems than those commonly observed in younger stands.

The development of a moss carpet increases the interception of water and nutrients, thus restricting their availability to roots within or immediately below the carpet. Under such conditions seral species may suffer from nutrient deprivation, if they are unable to relocate their root systems. Nutrient deprivation may also occur as a result of a change in the quality of litter, e.g., replacement of aspen by white spruce and balsam fir litter. As a result of these changes, plants such as aspen must survive on a reduced nutrient budget which results in decadence and reduced vigor of the species. The reduced vigor of aspen further promotes the development of white spruce.

Feathermoss carpets also appear to be a mechanism for regulating nutrient cycling. Such regulation develops in response to the synchronization of the water supply, decomposer activity, nutrient release, and nutrient absorption by roots, particularly if mycorrhizal associations are involved in the transfer of nutrients to plants. Reduced soil temperatures may also contribute to the accumulation of organic matter and regulation of nutrient release by slowing decomposition. A moss carpet may also efficiently limit the loss of nutrients from an ecosystem by intercepting throughfall nutrients and precipitation, while limiting their flow to the underlying soil horizons. Late successional plants respond to the development of a moss carpet and the accumulation of organic matter by developing an extensive network of fine-roots within and/or immediately below this zone.

Nutrient deprivation of seral species may also be experienced as a result of preemptive growth and niche partitioning by climax trees. These mechanisms of succession may develop through the growth of climax tree roots above those of seral species. As a result the climax species are able to intercept nutrients and moisture which would otherwise have been used by seral species. Niche partitioning can occur below-ground between climax species.

CHAPTER VII

CONCLUSIONS

Several conclusions and hypotheses can be drawn from the work described in this dissertation relative to the below-ground ecology of Boreal Mixedwood plant communities. However, much more research will be required to determine their regional and global validity, i.e. whether they represent basic principles and trends or only locally verified phenomena. These major findings may be summarized as follows:

1. Roots are concentrated in the upper 2 dm of the soil and root densities decrease exponentially with increasing depth. (p. 25)

2. Rooting depth increases with increasing stand age on sites lacking significant rooting restrictions. On other sites a maximum depth is reached and maintained earlier. (p. 27-30)

3. *Picea mariana* communities growing on poorly to very poorly drained soils have shallow rooting depths relative to *Populus tremuloides* and *Pinus banksiana* stands. Sandy soils had the deepest rooting depths. (p. 23)

4. Plants growing on xeric sites commonly have deep penetrating tap- and sinker roots which extend to depths >1 m (e.g., *Populus tremuloides, Pinus banksiana, Amelanchier alnifolia, Rosa acicularis, Arctostaphylos uva-ursi, Alnus crispa*), probably as a morphological adaptation for obtaining soil moisture from deep within the soil. (p. 52-53, 102-106)

5. Horizontal roots dominate the below-ground biomass of coniferous trees. (p. 45-46)

6. A root:shoot ratio of 0.25-0.35:1 can be expected for most upland trees in the 35-40 year age range. (p. 60)

7. Seral trees appear to have root systems which are morphologically more plastic than those of climax trees. (p. 65)

8. Variation in rooting depths represents a niche separation mechanism or dimension. (p. 66-67)

9. Precipitation infrequently percolates through the soil of Boreal Mixedwood communities due to the high water-holding capacity of the LFH and near-surface mineral soil horizons, and the small annual number (*ca.* <4) of heavy rainfall (>20 mm) and spring snowmelt events which are sufficient to recharge the entire soil profile. (p. 35, 112)

10. Soil moisture on upland sites was more available to plants rooted near the ground surface relative to moisture supplies occurring between 20-60 cm during the summer of 1982. This is thought to be the prevailing trend for Boreal Mixedwood communities, rather than a unique case. (p. 111)

11. An early summer (May to mid-June) soil moisture deficit may be more critical to plant survival and seed production in central Alberta than the more common late-summer moisture deficit which characterizes southern portions of the province. (p. 86-91)

12. Shallow-rooted plants, particularly ericaceous and/or evergreen species (e.g., *Vaccinium vitis-idaea*, *V. myrtilloides*, *Pyrola asarifolia*), have more widely fluctuating plant water potentials (Ψt) than more deeply rooted species. (p. 113)

13. Summer plant water potential patterns of different tree species were more similar than site differences might suggest. This is in part a response to below-ground adaptations for obtaining moisture on xeric sites and very shallow rooting on hygric sites where excess moisture occurs. (p. 86-91, 98)

14. The root distribution pattern of seral *Populus tremuloides* communities are more strongly correlated

with soil nutrients in the LFH layer of the soil than subclimax *Picea-Abies* stands. (p. 144-145)

15. Phosphorus appears to be an important limiting factor to plant community development on upland sites within the Hondo-Lesser Slave Lake study area. (p. 141)

16. Niche separation occurs below-ground between co-existing seral and climax trees as well as among climax trees. Such separations are a result of different rooting depths. For example, jack pine (a seral species) has its main lateral roots in mineral soil, whereas white spruce and balsam fir (a climax species) develop their lateral roots in the LFH horizon. These different rooting depths represent a physical separation of root systems. In addition, balsam fir has deep penetrating oblique lateral and tap-roots which further reduce the niche overlap between itself and white spruce, assuming these roots provide an absorptive as well as a support function. (p. 66-68)

17. The growth of climax tree (*Abies balsamea, Picea glauca*) roots above those of seral species may cause resource preemption and competitive exclusion, and may be a successional mechanism. Coupled synergistically with changes in microclimate and soil litter composition, the root behavior of climax species may promote their growth at the expense of seral species. (p. 34-35)

18. Feathermoss carpets appear to be important interceptors of nutrients and water. (p. 34-35)

19. *Populus tremuloides* seems to be more susceptible to nutrient deprivation by feathermoss carpets than *Pinus banksiana* which tends to be a more oligotrophic species than *Populus*. (p. 66-68)

20. *Abies balsamea* and *Picea glauca* have root systems which are morphologically more similar to each other on clay loam than on sandy soils where niche overlap between these species is minimal. (p. 68, 115).

21. Succession appears to reduce the length and severity of plant water deficits and increase the synchronization of summer plant water potential patterns. (p. 118)

22. Sample size estimates indicate that 30-40, 40-200, and >200 root density samples (one sample/horizon/pits) would be required to obtain surface (LFH, A), B, and C horizon root densities within 15% of the true population mean at the P<95% level, respectively (Husch 1963, p. 358). These estimates were based on root density values (n=7) which were similar to those used in Table 12. (p. 129)

This study has demonstrated that the relationships between boreal plants and their edaphic environments are no less complex than those recognized in above-ground studies. Although root systems may not prove to be the ultimate key to an understanding of plant community development and species co-existence questions, they do appear to play a more significant role than was previously thought. In addition, root studies of plant communities may provide a new perspective on old ecological questions. It is now difficult to conceive of a definitive study of plant/edaphic relationships without detailed attention to root systems. Root system studies thus represent, from a descriptive as well as experimental perspective, a reservoir of relatively untapped research possibilities.

REFERENCES

ACHUFF, P.L., and G.H. LA ROI. 1977. *Picea-Abies* forests in the highlands of northern Alberta. Vegetatio, 23:127-146.

ADAMS, W.R. and G.L. CHAPMAN. 1941. Competition influence on the root systems of jack and Norway pines. Vermont Agric. Exp. Stn., Burlington, Vermont. Bull. 472.

ALBAN, D.H., and P.R. LAIDLY. 1982. Generalized biomass equations for jack pine and red pine in the Lake States. Can. J. For. Res. 12:913-921.

ANONYMOUS. 1974. The system of soil classification for Canada. Can. Dept. Agric., Ottawa, Ont. Publ. 1455.

------- 1978. The Canadian system of soil classification. Can. Dept. Agric. Publ. 1646. Supply and Services Canada, Ottawa, Ont.

------- 1978-1982a. Monthly records. Environment Canada, Atmospheric Environment Service, Downsview, Ont.

------- 1982a. Canadian normals temperature - precipitation 1951-1980. Environment Canada, Atmospheric Environment Service, Downsview, Ont.

AUSTIN, R.C., and D.H. BAISINGER. 1955. Some effects of burning on forest soils of western Oregon and Washington. J. For. 53:275-280.

BALLARD, T.M. 1980. Tree nutrition. *In* Proceedings: Workshop on Reconstruction of Forest Soils in Reclamation. *Edited by* Ziemkiewizc, P.F., S.K. Takyi, and H. Regier. Alberta Land Conservation and Reclam- ation Council, Edmonton, Alta. Rep. #RRTAC 80-4. pp. 9-20.

BANNAN, M.W. 1940. The root systems of northern Ontario conifers growing in sand. Amer. J. Bot. 27:108-114.

BARBOUR, M.G., J.H. BURK, and W.D. PITTS. 1981. Terrestrial plant ecology. The Benjamin/Cummings Publishing Co., Inc., Menlo, Ca.

BARNES, B.V. 1966. The clonal growth habit of American aspens. Ecology, 47:439-447.

BARTOS, D.L., and R.S. JOHNSTON. 1978. Biomass and nutrient content of quaking aspen at two sites in the western United States. For, Sci. 24:273-280.

BATANOUNY, K.H., and A.M. ABDEL WAHAB. 1973. Eco-physiological studies of Desert Plains. VIII. Root penetration of *Lepladenia pyrotechnica* (Forsk.) Decne. in relation to its water balance. Oecologia, 11:151-161.

BERENDSE, F. 1979. Competition between plant populations with different rooting depths: I. Theoretical considerations. Oecologia, 43:19-26.

BERENDSE, F. 1981. Competition between plant populations with different rooting depths. II. Pot experiments. Oecologia, 48:334-341.

BERISH, C.W. 1982. Root biomass and surface area in three successional tropical forests. Can. J. For. Res. 12:699-704.

BERNDT, H.W., and R.D. GIBBONS. 1958. Root distribution of some native trees and understory plants growing on three sites within ponderosa pine watershed in Colorado. U.S. Dept. Agric. For. Serv. Rocky Mountain For. Range Exp. Stn., Paper No. 37.

BIRD, C.D. 1970. Keys to the lichens of west-central Canada. University of Calgary, Dept. Biology, Calgary, Alta.

BOHM, W. 1979. Methods of studying root systems. Springer-Verlag, Berlin. Ecological Studies No. 33.

BORMANN, F.H. and G.E. LIKENS. 1979. Pattern and process in a forested ecosystem. Springer-Verlag, N.Y.

BRAY, J.R., and J.T. CURTIS. 1957. An ordination of the upland forest communities of southern Wisconsin. Ecol. Monogr. 27:325-349.

CAJANDER, A.K. 1926. The theory of forest types. Acta For. Fenn. 29:1-108.

CALMES, M.A., and J.C. ZASADA. 1982. Some reproductive traits of four shrub species in black spruce forest types of Alaska. Can. Field-Nat. 96:35-40.

CARLTON, T.J. 1982. The composition, diversity, and heterogenity of some jack pine (*Pinus banksiana*) stands in northeastern Ontario. Can. J. Bot. 60:2629-2636.

CHEYNEY, E.G. 1928. The root system of the hazel. Jour. For. 26:1046-1047.

------- 1929. A study of the roots in a square yard of jack pine forest. J. For. 27:546-549.

------- 1932. The roots of a jack pine tree. J. For. 30:929-932.

CHAPIN, F.S.,III, P.R. TYRON, and K. VAN CLEVE. 1983. Influence of phosphorus on growth and biomass distribution of Alaskan taiga tree seedlings. Can. J. For. Res. 13:1092-1098.

CLINE, R.G., and G.S. CAMPBELL. 1976. Seasonal and diurnal water relations of selected forest species. Ecology, 57:367-373.

COLMAN, E.A., and T.M. HENDRIX. 1949. The fiberglas electrical soil-moisture instrument. Soil Sci. 67:425-438.

COUPLAND, R.T., and R.E. JOHNSON. 1965. Rooting characteristics of native grassland species in Saskatchewan. J. Ecol. 53:475-507.

CRITCHFIELD, H.J. 1966. General climatology. 2nd Edition. Prentice-Hall, Inc., Englewood Cliffs, N.J.

DAUBENMIRE, R. 1941. Some ecological features of the subterranean organs of alpine plants. Ecology, 22:370-378.

DAUBENMIRE, R. 1968. Plant Communities. Harper & Row, Publishers, N.Y.

DAY, M.W. 1944. The root system of aspen. Am. Midl. Nat. 32:502-509.

DIAMOND, J.M. 1973. Distributional ecology of New Guinea birds. Science, 179:759-769.

DIRSCHL, H.J., D.L. DABBS, and G.C. GENTLE. 1972. Landscape classification and vegetation successional trends in the Peace-Athabasca Delta. Canadian Wildlife Service.

EHLERINGER, J.R., and P.C. MILLER. 1975. Water relations of selected plant species in the alpine tundra, Colorada. Ecology, 56:370-380.

EIS, S. 1970. Root growth relationships of juvenile white spruce, alpine fir, and lodgepole pine on three soils in the interior of British Columbia. Can. Dept. Fish and For., Can. For. Serv. Publ. No. 1276.

------- 1974. Root system morphology of western hemlock, western red cedar, and Douglas-fir. Can. J. For. Res. 4:28-38.

EIS, S. 1978. Natural root forms of western conifers. Symposium on root form of planted trees, Victoria, B.C. May 16-19, 1978.

FAHEY, T.J. 1983. Nutrient dynamics of aboveground detritus in lodgepole pine (*Pinus contorta* ssp. *latifolia*) ecosystems, southeastern Wyoming. Ecol. Monogr. 53:51-72.

FAYLE, D.C.F. 1975. Extension and longitudinal growth during the development of red pine root systems. Can. J. For. Res. 5:109-121.

FOSTER, N.W., and I.K. MORRISON. 1976. Distribution and cycling of nutrients in a natural *Pinus banksiana* ecosystem. Ecology, 57:110-120.

FOX, D.J., and K.E. GUIRE. 1976. Documentation for MIDAS. 3rd Ed. University of Michigan, Statistical Research Laboratory, Ann Arbor, Mi.

FRANKLIN, J.F., and C.T. DYRNESS. 1973. Natural vegetation of Oregon and Washington. U.S. Dep. Agric., For. Serv., Gen. Tech. Rep. PNW-8.

GIST, G.R. and R.M. SMITH. 1948. Root development of several common forage grasses to a depth of eighteen inches. Am. Soc. Agron. 40: 1036-1042.

GRACE, J.B. and R.G. WETZEL. 1982. Niche differentiation between two rhizomatous plant species: *Typha latifolia* and *Typha angustifolia*. Can. J. Bot. 60:46-57.

HALLIDAY, W.E.D., and A.W.A. BROWN. 1943. The distribution of some important forest trees in Canada. Ecol. 24:353-373.

HARDY AND ASSOCIATES. 1978. ALSANDS project group: Environmental impact assessment. Report prepared for Alberta Environment, Edmonton, Alta.

HARLOW, W.M. and E.S. HARRAR. 1968. Textbook of dendrology. 5th Edition. McGraw-Hill Book Company. N.Y.

HARPER, J.L. 1977. Population biology of plants. Academic Press, London, England.

HEGYI, F. 1972. Dry matter distribution in jack pine stands in northern Ontario. For. Chron. 48:193-197.

HELLKVIST, J., G.P. RICHARDS, and P.G. JARVIS. 1974. Vertical gradients of water potential and tissue water relationships in Sitka spruce trees measured with the pressure chamber. J. Appl. Ecol. 11:637-667.

HELLMERS, H., J.S. HORTON, G. JUHREN, and J. O'KEEFE. 1955. Root systems of some Chaparral plants in southern California. Ecology, 36:667-678.

HOLLOWAY, P., and J. ZASADA. 1979. Vegetative propogation of 11 common Alaska woody plants. U.S. Dept. Agric. For. Serv. Pacific Northwest For. and Experiment Stn. Res. Note No. PNW-334.

HORTON, K.W. 1956. The ecology of lodgepole pine in Alberta and its role in forest succession. Can. Dep. North. Aff. and Natl. Resour., For. Res. Div., Tech. Note 45.

------- 1958. Rooting habits of lodgepole pine. Dept. Northern Can. Dep. North. Aff. and Natl. Resour., For. Res. Div., Tech. Note No. 67.

HORTON, K.W., and J.C. LEES. 1961. Black spruce in the foothills of Alberta. Can. Dep. For., Tech. Note No. 110.

HUCSH, B. 1963. Forest mensuration and statistics. The Ronald Press Co., N.Y.

IRELAND, R.R., C.D. BIRD, G.R. BRASSARD, W.C. SCHOFIELD, and D.H. VITT. 1980. Checklist of the mosses of Canada. National Museum of Canada, Publ. of Botany. No. 8.

ISEBRANDS, J.G., and T.R. CROW. 1975. Introduction to use and interpretation of Principal Component Analysis in forest biology. U.S. Dep. Agric., For. Serv. Gen. Tech. Rep. NC-17.

JEFFREY, W.W. 1959. White spruce rooting modifications on the fluvial deposits of the lower Peace River. For. Chron. 35:304-311.

JOHNSTONE, W.D., and E.B. PETERSON. 1980. Above-ground component weights in Alberta *Populus* stands. Environment Canada, Forest Service, Inf. Rep. NOR-X-226.

KABZEMS, A., A.L. KOSOWAN, and W.C. HARRIS. 1976. Mixedwood section in an ecological perspective, Saskatchewan. Dept. Tourism and Renewable Resources, For. Branch. Tech. Bull. No. 8.

KAUFMAN, C.M. 1945. Root growth of jack pine on several sites in the Cloquet Forest, Minnesota. Ecology, 26:10-23.

KEYES, M.R. and C.C. GRIER. 1981. Above- and below-ground net production in 40-year-old Douglas-fir stands on low and high productivity sites. Can. J. For. Res. 11:599-605.

KIMMINS, J.P., and B.C. HAWKES. 1978. Distribution and chemistry of fine roots in a white spruce-subalpine fir stand in British Columbia: implications for management. Can. J. For. Res. 8:265-279.

KORNER, Ch., J.A. SCHEEL, and H. BROWN. 1979. Maximum leaf diffusive conductance in vascular plants. Photosynthetica, 13:45-82.

KOSTLER, J.N., E. BRUCKNER, and H. BIBELRIETHER. 1968. Die wurzeln der waldbaume. Verlag Paul Parey, Hamburg, Germany.

KRAJINA, V.J. 1965. Biogeoclimatic zones and classification of British Columbia. Ecology West. North Amer. 1:1-17.

LARCHER, W. 1975. Physiological plant ecology. Translated by M.A. Biederman-Thorson. Springer-Verlag, Berlin, Germany.

LA ROI, G.H., and M. OSTAFICHUK. 1982. Structural dynamics of boreal forest ecosystems on three habitat types in the Hondo-Lesser Slave Lake area of north central Alberta in 1981. Prepared for Alberta Environment and Alberta Recreation and Wildlife, Edmonton. RMD-80/35A.

------- 1984. Structural dynamics of boreal forest ecosystems. 1. Site properties, physiognomy and species composition of the plant communities. Can. J. Bot. (Submitted).

LeBARRON, R.K. 1945. Adjustment of black spruce root systems to increased depth of peat. Ecol. 26:309-311.

MacARTHUR, R.H. 1958. Population ecology of some warblers of northeastern coniferous forests. Ecology, 39:599-619.

McGILL, W.B., and C.V. COLE. 1982. Comparative aspects of cycling of organic C, N, S and P through soil organic matter. Geoderma, 26:267-286.

McKEAGUE, J.A. (editor). 1976. Manual on soil sampling and methods of analysis. Can. Dep. Agric., Soil Research Inst., Ottawa, Ont.

MEYER, F.H., and D. GOTTSCHE. 1971. Distribution of root tips and tender roots of beech. *In* Integrated experimental ecology. Ecological Studies, Vol. 2. *Edited by* H. Ellenberg, Springer Verlag, N.Y. pp. 48-52.

MOSS, E.H. 1953a. Marsh and bog vegetation in northwestern Alberta. Can. J. Bot. 31:448-470.

------- 1953b. Forest communities in northwestern Alberta. Can. J. Bot. 31:212-252.

------- 1955. The vegetation of Alberta. Bot. Rev. 21:493-567.

------- 1959. Flora of Alberta. University of Toronto Press, Toronto, Ont.

MUC, M. 1977. Ecology and primary production of Sedge-moss Meadow communities, Truelove Lowlands. *In* Truelove Lowland, Devon Island, Canada: A high Arctic ecosystem. *Edited by* L.C. Bliss. University of Alberta Press, Edmonton, Alta. pp. 157-186.

MUELLER-DOMBOIS, D., and H.P. SIMS. 1966. Response of three grasses to two soils and a water table depth gradient. Ecology, 47:644-648.

NOSKO, P. 1984. A comparative study of plant adaptations of *Alopecurus alpinus* in the Canadian High Arctic. Ph.D. Dissertation. University of Alberta, Edmonton, Alta.

OBERBAUER, S.F., and W.D. BILLINGS. 1981. Drought tolerance and water use by plants along an Alpine topographic gradient. Oecologia, 50:325-331.

ODUM, E.P. 1969. The strategy of ecosystem development. Science, 164:262-270.

PARKER, W.C., S.G. PALLARDY, T.M. HINCKLEY, and R.O. TESKEY. 1982. Seasonal changes in tissue water relations of three woody species of the *Quercus-Carya* forest types. Ecology, 63:1259-1267.

PARRISH, J.A.D. and F.A. BAZZAZ. 1976. Underground niche separation in successional plants. Ecology, 57:1281-1288.

------- 1982a. Competitive interactions in plant communities of different successional ages. Ecology, 63:314-320.

-------. 1982b. Responses of plants from three successional communities to a nutrient gradient. J. Ecol. 70:233-248.

PASTOR, J., and J.G. BOCKHEIM. 1981. Biomass and production of an aspen-mixed hardwood-spodsol ecosystem in northern Wisconsin. Can. J. For. Res. 11:132-138.

PERSSON, T. (editor). 1980a. Structure and function of northern coniferous forests - an ecosystem study. Ecol. Bull. (Stockholm) 32.

------- 1980b. Spatial distribution of fine-root growth, mortality and decomposition in a young Scots pine stand in central Sweden. Oikos, 34:77-87.

PETERSON, E.B., and A.G. LEVINSOHN. 1977. Vegetation types and forest productivity, west of Syncrude Lease 17, Alberta. Syncrude Canada Ltd., Environmental Research Monogr. 1977-6.

PIANKA, E.R. 1969. Sympatry of desert lizards (*Ctenotus*) in western Australia. Ecol. 50:1012-1030.

POOLE, D.K., and R.C. MILLER. 1975. Water relations of selected species of chaparral and coastal sage communities. Ecology, 56:1118-1128.

POWERS, R.F. 1980. Mineralizable soil nitrogen as an index of nitrogen availability to forest trees. Soil Sci. Soc. Am. J. 44:1314-1320.

PRESTON, R.J., Jr. 1942. The root growth and development of the root systems of juvenile lodgepole pine. Ecol. Monogr. 12:449-468.

ROBERTS, S.W., K.R. KNOERR, and B.R. STRAIN. 1979. Comparative field water relations of four co-occurring forest tree species. Can. J. Bot. 57:1876-1882.

ROWE, J.S. 1956. Vegetation of the southern boreal forest in Saskatchewan and Manitoba. Ph.D. Dissertation, University of Manitoba, Winnipeg, Man.

------- 1972. Forest regions of Canada. Can. For. Serv., Publ. No. 1300.

------- 1979. Concepts of fire effects on plant individuals and species. Paper presented at Symposium: Fire in Northern Circumpolar Ecosystems. Fredericton, New Brunswick. October 22-24, 1979.

RUTHERFORD, M.C. 1983. Growth ratts, biomass and distribution of selected woody plant roots in *Burkea africa-Ochna pulchra* savanna. Vegetatio, 52:45-63.

SCHOLANDER, P.F., H.T. HAMMEL, E.D. BRADSTREET, and E.A. HEMMINGSEN. 1965. Sap pressure in vascular plants. Science, 148:339-346.

SCHULTZ, J.D. 1969. The vertical rooting habit in black spruce, white spruce, and balsam fir. Ph.D. Dissertation, University of Michigan, Ann Arbor, Mi.

SIDLE, R.C., and C.G. SHAW, III. 1983. Evaluation of planting sites common to a southeastern Alaska clear--cut. I. Nutrient status. Can. J. For. Res. 13:1-8.

SIMS, H.P. 1964. Root development of jack pine seedlings on burned-over dry sites in southeastern Manitoba. Can. Dep. For., Publ. No. 1061.

SINGH, T. 1982. Biomass equations for ten major tree species of the prairie provinces. Environment Canada, Forest Service, Inf. Report NOR-X-242.

SOKAL, R.R. and F.J. ROHLF. 1981. Biometry. 2nd Edition. W.H. Freeman and Co., San Francisco, Ca.

SPIEGEL, M.R. 1961. Schaum's outline of theory and problems of statistics. McGraw-Hill Book Company, N.Y.

STEEL, R.G.D. and J.H. TORRIE. 1960. Principles and procedures of statistics. McGraw-Hill Book Co., Inc., N.Y.

ST. JOHN, T.V. 1983. Response of tree roots to decomposing organic matter in two lowland Amazonian rain forests. Can. J. For. Res. 13:346-349.

STONER, W.A., and P.C. MILLER. 1975. Water relations of plant species in the wet coastal tundra at Barrow, Alaska. Arctic Alpine Res. 7:109-124.

ST. ONGE, D.A. 1972. Sequence of glacial lakes in north-central Alberta. Geological Survey of Canada, Dept. Energy, Mines, and Resources, Ottawa, Ont. Bull. 213.

STRINGER, P.W. 1976. A preliminary vegetation survey of the Alberta Oil Sands Environmental Research Project Study Area. Alberta Oil Sands Environmental Research Project, Sub-project VE 2.2.

STRONG, W.L, and G.H. LA ROI. 1983a. Rooting depths and successional development of selected boreal forest communities. Can. J. For. Res. 13:577-588.

------- 1983b. Root-system morphology of common boreal forest trees in Alberta, Canada. Can. J. For. Res. 13:1164-1173.

------- 1984a. Soil-plant water relationships in selected boreal forest communities of central Alberta. Can. J. For. Res. (Submitted).

------- 1984b. Root density - soil relationships in selected boreal forests of central Alberta, Canada. For. Ecol. Manage. (Submitted).

STRONG, W.L. and K.R. LEGGAT. 1981. Ecoregions of Alberta. Alberta Energy and Natural Resources, Edmonton, Alta. ENR Tech. Rept. No. T/4.

SUCOFF, E. 1982. Water relations of the aspens. Minn. Agric. Exp. Stn. Tech. Bull. No. 338.

TIESZEN, L.L., M.C. LEWIS, P.C. MILLER, J. MAYO, F.S. CHAPIN III, and W. OECHEL. 1981. An analysis of processes of primary production in tundra growth forms. *In* Tundra ecosystems: a comparative analysis. *Edited by* L.C. Bliss, O.W. Heal, and J.J. Moore. Cambridge Univ. Press, Cambridge, England. IBP 25.

VAN CLEVE, K., and C.T. DYRNESS. 1983. Introduction and overview of a multidisciplinary research project: the structure and function of black spruce (*Picea mariana*) forests in relation to other fire-affected taiga ecosystems. Can. J. For. Res. 13:695-702.

VAN CLEVE, K., L. OLIVER, R. SCHLENTNER, L.A. VIERECK, and C.T. DYRNESS. 1983. Productivity and nutrient cycling in taiga forest ecosystems. Can. J. For. Res. 13:747-766.

VOGT, K.A., R.L. EDMONDS, and C.C. GRIER. 1981. Seasonal changes in biomass and vertical distribution of mycorrhizal and fibrous-textured conifer fine roots in 23- and 180-year-old subalpine *Abies amabilis* stands. Can. J. For. Res. 11:223-229.

VOGT, K.A., C.C. GRIER, C.E. MEIER, and R.L. EDMONDS. 1982. Mycorrhizal role in net primary production and nutrient cycling in *Abies amabilis* ecosystems in western Washington. Ecology, 63:370-380.

WAGG, J.W.B. 1967. Origin and development of white spruce root-forms. Can. For. Branch Dep. Publ. No. 1192.

WARING, R.H. 1969. Forest plants of the eastern Siskiyous: Their environmental and vegetational distribution. Northwest Sci. 43:1-17.

WEAVER, J.E. 1968. Prairie plants and their environment. Univ. of Nebraska Press, Lincoln, Ne.

WEAVER, J.E., and F.W. ALBERTSON. 1956. Grasslands of the Great Plains, their nature and use. Johnsen Publishing Co., Lincoln, Nebraska.

WEBER, M.G., and K. VAN CLEVE. 1981. Nitrogen dynamics in the forest floor of interior black spruce ecosystems. Can. J. For. Res. 11:743-751.

WHITTAKER, R.H. 1956. Vegetation of the Great Smoky Mountains. Ecol. Monogr. 26:1-80.

-------- 1975. Communities and ecosystems. 2nd Edition. MacMillian Publishing Co., Inc. N.Y.

WIELAND, N.K., and F.A. BAZZAZ. 1975. Physiological ecology of three codominant successional annuals. Ecology, 56:681-688.

YANG, S.J., and E. de JONG. 1971. Diurnal fluctuations and relative magnitude of water potentials in wheat tissue. Can. J. Plant Sci. 51:333-336.

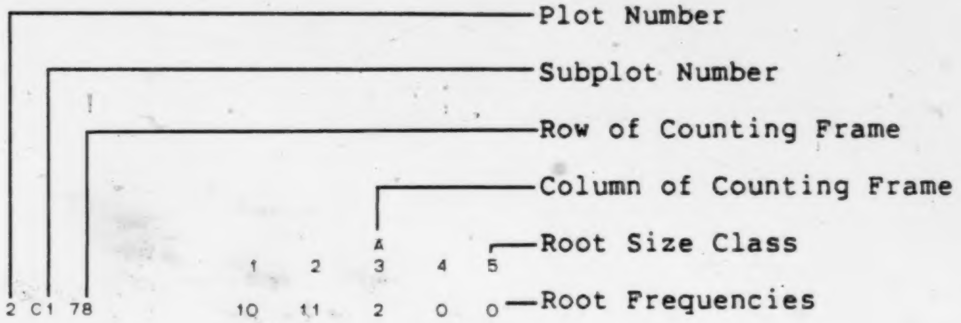
YEATMAN, C.W. 1955. Tree root development on upland heaths. Forestry Commission, Bull. No. 21. Her Majesty's Stationery Office, London, England.

ZOBEL, D.B., A. McKEE, G.M. HAWK, and C.T. DYRNESS. 1976. Relationships of environment to composition, structure, and diversity of forest communities of the central Western Casades of Oregon. Ecol. Monogr. 46:135-156.

APPENDIX I

ROOT PROFILE DATA

Appendix I contains the 77 root profile counts which were used in Chapter II. The Plot, subplot, counting cell by row and column, and number and size of roots per cell are given within the following table. For example,


Plot Number
Subplot Number
Row of Counting Frame
Column of Counting Frame
Root Size Class
Root Frequencies
A
1 2 3 4 5
2 C1 78 10 11 2 0 0

Root Size Classes

A - <0.075 mm

B - 0.075 - 1.0 mm

C - 1.0 - 2.0 mm

D - 2.0 - 5.0 mm

E - >5.0 mm

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
01 B3 01	4	55	0	0	0	4	22	0	0	0	4	26	0	0	0	8	23	0	0	0
01 B3 02	12	30	0	0	0	2	30	1	0	0	5	29	0	0	0	5	26	1	0	0
01 B3 03	4	22	0	0	0	5	15	2	0	0	4	7	0	0	2	6	7	2	0	0
01 B3 04	3	13	0	0	0	5	8	1	0	0	1	10	0	0	0	5	11	0	1	0
01 B3 05	2	11	2	0	0	4	5	0	0	0	4	15	0	0	0	2	6	0	0	0
01 B3 06	2	10	1	0	0	1	6	0	0	0	4	4	0	0	0	3	3	0	0	0
01 B3 07	2	5	0	0	0	6	3	0	0	0	5	6	1	0	0	2	6	0	0	0
01 B3 08	3	3	0	0	0	4	6	0	0	0	7	11	0	0	0	4	1	0	0	0
01 B3 09	6	5	0	0	0	3	4	0	0	0	3	4	0	1	0	6	4	0	0	0
01 B3 10	0	1	0	0	0	2	5	0	0	0	7	1	0	0	0	2	1	0	0	0
01 B3 11	0	2	0	0	0	4	1	0	0	0	3	3	0	0	0	0	1	0	0	0
01 B3 12	0	1	0	0	0	0	0	0	0	0	2	2	0	0	0	2	0	0	0	0
01 B3 13	1	11	0	0	0	0	1	0	0	0	0	3	0	0	0	4	2	0	0	0
01 B3 14	0	4	0	0	0	1	5	0	0	0	0	5	0	0	0	0	2	0	0	0
01 B3 15	3	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	0	0	0
01 B3 16	2	0	0	0	0	0	1	0	0	0	1	4	0	0	0	0	2	0	0	0
01 B3 17	0	0	0	0	0	1	1	0	0	0	0	7	0	0	0	3	5	0	0	0
01 B3 18	0	0	0	0	0	1	0	0	0	0	2	4	0	0	0	0	1	0	0	0
01 B3 19	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0
01 B3 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
01 B3 21	2	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0
01 B3 22	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
01 B3 23	0	0	0	0	0	0	2	0	0	0	2	2	0	0	0	0	1	0	0	0
01 B3 24	0	0	0	0	0	1	0	0	0	0	2	2	0	0	0	0	2	0	0	0
01 B3 25	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0
01 B3 26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
01 B3 27	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
01 B3 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 B3 29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 B3 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 B3 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 B3 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 B3 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 B3 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 B3 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 B3 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 B3 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 B3 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 B3 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 B3 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
01 B3 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 B3 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A 1	A 2	A 3	A 4	A 5	B 1	B 2	B 3	B 4	B 5	C 1	C 2	C 3	C 4	C 5	D 1	D 2	D 3	D 4	D 5
01 B3 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 B3 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 B3 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 B3 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 B3 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 B3 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 B3 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 B3 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 B3 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 B3 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 01	2	9	0	0	0	0	13	0	0	0	2	17	0	0	0	3	6	0	0	0
01 D2 02	13	26	0	0	0	5	21	0	0	0	9	18	0	0	0	8	16	0	0	0
01 D2 03	7	22	0	0	0	6	16	0	0	0	11	13	0	0	0	7	5	0	0	0
01 D2 04	2	18	0	0	0	0	6	0	0	0	1	6	1	1	0	6	7	0	0	0
01 D2 05	3	13	0	0	0	0	9	0	0	1	6	6	0	0	0	3	2	0	0	0
01 D2 06	2	15	1	0	0	1	10	0	0	0	2	8	0	0	0	0	5	1	1	0
01 D2 07	3	6	0	0	0	2	0	0	0	1	2	8	0	0	0	0	2	0	0	0
01 D2 08	2	0	1	0	0	1	0	0	0	0	0	4	1	0	0	0	2	0	0	0
01 D2 09	3	4	1	0	0	3	1	0	0	0	0	0	0	0	0	0	3	0	0	0
01 D2 10	2	3	0	0	0	0	3	0	0	0	0	2	0	0	0	0	1	0	0	1
01 D2 11	4	3	0	0	0	0	1	0	0	0	0	3	0	0	0	0	5	0	0	0
01 D2 12	0	2	0	0	0	3	4	0	0	0	0	3	0	0	0	0	2	0	0	0
01 D2 13	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	4	0	0	0
01 D2 14	0	0	0	0	0	0	3	0	0	0	0	6	0	0	0	0	1	0	0	0
01 D2 15	0	5	0	0	0	0	5	0	0	0	0	3	0	0	0	0	0	0	0	0
01 D2 16	0	8	0	0	0	3	0	0	0	0	1	3	0	0	0	0	1	0	0	0
01 D2 17	1	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0
01 D2 18	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 20	0	6	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 21	0	2	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 23	0	0	0	0	0	0	1	0	0	0	0	3	0	0	0	0	1	0	0	0
01 D2 24	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
01 D2 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 31	0	5	0	0	0	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0
01 D2 32	0	6	0	0	0	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
01 D2 33	0	2	0	0	0	0	3	0	0	0	0	0	1	0	0	0	0	0	0	0
01 D2 34	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0
01 D2 35	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 D2 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 01	0	3	0	0	0	6	10	0	0	0	14	9	0	0	0	8	27	0	0	0
01 E1 02	3	11	0	0	0	6	22	0	0	0	16	26	0	0	0	12	14	0	0	0
01 E1 03	6	11	0	0	0	7	18	1	0	0	6	15	1	0	0	9	19	0	0	0
01 E1 04	3	14	0	0	0	3	10	0	0	0	2	12	1	0	0	5	12	0	0	0
01 E1 05	2	1	1	0	0	4	4	2	0	0	1	9	0	0	1	3	11	0	0	0
01 E1 06	0	2	0	0	0	2	4	1	0	0	4	8	0	1	0	1	6	0	0	0
01 E1 07	0	1	0	0	0	1	6	0	0	0	0	11	0	0	0	0	10	0	0	0
01 E1 08	0	1	0	0	0	0	8	0	0	0	1	8	0	0	0	1	2	0	0	0
01 E1 09	0	6	0	0	0	0	4	0	0	0	0	8	0	0	0	0	12	0	0	0
01 E1 10	0	2	0	0	0	0	1	0	0	0	0	1	0	0	0	1	6	0	0	0
01 E1 11	0	6	0	0	0	0	5	0	0	0	0	2	0	0	0	0	5	0	0	0
01 E1 12	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
01 E1 13	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	8	0	0	0
01 E1 14	0	0	0	0	0	0	4	0	0	0	0	1	0	0	0	0	7	0	0	0
01 E1 15	0	4	0	0	0	1	0	0	0	0	0	2	0	0	0	0	10	0	0	0
01 E1 16	0	0	0	0	0	0	1	0	0	0	2	3	0	0	0	0	0	0	0	0
01 E1 17	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	1	0	0	0
01 E1 18	0	0	0	0	0	0	3	0	0	0	0	17	0	0	0	0	0	0	0	0
01 E1 19	0	0	0	0	0	0	4	0	0	0	2	13	0	0	0	0	1	0	0	0
01 E1 20	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
01 E1 21	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
01 E1 22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
01 E1 23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 24	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
01 E1 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E1 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 01	0	12	0	0	0	11	15	0	0	0	0	22	0	0	0	2	14	0	0	0
01 E2 02	6	16	2	0	0	2	17	0	0	0	2	23	0	0	0	5	15	0	0	0
01 E2 03	2	26	0	0	0	3	14	0	0	0	3	15	1	1	0	3	9	1	1	0
01 E2 04	0	8	0	0	0	0	9	0	0	0	2	14	2	0	0	5	9	2	0	0
01 E2 05	1	5	0	0	0	1	7	0	0	0	1	16	0	1	0	3	7	0	1	0
01 E2 06	11	7	0	0	0	15	8	0	0	0	5	11	2	0	0	10	6	0	0	0
01 E2 07	4	2	0	0	0	1	6	0	0	0	8	3	0	0	0	3	6	1	0	0
01 E2 08	3	2	0	0	0	2	7	2	0	0	6	9	0	0	0	2	6	1	0	0
01 E2 09	0	3	0	0	0	6	10	0	0	0	7	5	0	0	0	2	2	0	0	0
01 E2 10	1	1	0	0	0	1	6	0	0	0	4	4	0	0	0	0	3	0	0	0
01 E2 11	0	1	0	0	0	1	4	0	0	0	0	0	0	0	0	0	4	0	0	0
01 E2 12	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	1	1	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
01 E2 13	0	2	0	0	0	0	2	0	0	0	0	4	0	0	0	0	2	0	0	0
01 E2 14	0	1	0	0	0	0	0	0	0	0	0	7	0	0	0	0	1	0	0	0
01 E2 15	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 16	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 17	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 18	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 19	0	3	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
01 E2 20	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	9	0	0	0
01 E2 21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 E2 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 F4 1	12	14	0	0	0	11	11	0	0	0	8	9	1	0	0	3	5	0	0	0
01 F4 2	14	16	0	0	0	17	9	0	0	0	13	17	0	0	0	4	14	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
01 F4 3	6	12	1	1	0	18	13	0	0	0	7	8	0	0	0	25	6	2	0	1
01 F4 4	9	7	1	0	0	10	6	1	0	0	12	1	0	1	0	13	5	0	0	0
01 F4 5	12	12	0	0	0	10	5	0	0	0	9	6	0	1	0	6	1	2	0	0
01 F4 6	4	5	2	0	0	2	8	0	0	0	1	5	1	0	0	2	3	0	1	0
01 F4 7	8	1	1	0	0	4	2	0	0	0	3	5	0	0	0	3	1	1	0	0
01 F4 8	2	2	0	0	0	3	2	0	0	0	3	2	1	0	0	7	0	1	1	0
01 F4 9	3	0	0	0	0	12	13	0	0	0	7	8	0	0	0	6	10	0	0	0
01 F4 10	0	1	0	0	0	1	8	0	0	0	2	4	0	0	0	5	11	0	0	0
01 F4 11	0	1	0	0	0	3	1	0	0	0	3	4	0	0	0	2	5	0	0	0
01 F4 12	1	6	0	0	0	4	0	0	0	0	3	5	0	0	0	4	6	0	0	0
01 F4 13	4	7	0	0	0	7	6	0	0	0	4	3	0	0	0	10	5	0	0	0
01 F4 14	13	20	0	0	0	8	5	0	0	0	1	1	0	0	0	3	2	0	0	0
01 F4 15	5	3	0	0	0	6	0	0	0	0	1	0	0	0	0	1	0	0	0	0
01 F4 16	3	3	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
01 F4 17	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	4	0	0	0
01 F4 18	3	0	0	0	0	0	0	0	0	0	2	3	0	0	0	0	1	0	0	0
01 F4 19	2	0	0	0	0	2	1	0	0	0	0	2	0	0	0	0	0	0	0	0
01 F4 20	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 F4 21	0	0	0	0	0	3	1	0	0	0	0	1	0	0	0	0	0	0	0	0
01 F4 22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 F4 23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 F4 24	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
01 F4 25	0	0	0	0	0	0	9	0	0	0	0	1	0	0	0	0	0	0	0	0
01 F4 26	0	1	0	0	0	0	3	1	0	0	0	1	0	0	0	0	1	0	0	0
01 F4 27	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 F4 28	0	3	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	0	0	0
01 F4 29	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 F4 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 F4 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0
01 F4 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
01 F4 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 F4 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 F4 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 F4 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 F4 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 F4 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 F4 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 F4 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 F4 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 F4 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 F4 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 F4 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A 1	A 2	A 3	A 4	A 5	B 1	B 2	B 3	B 4	B 5	C 1	C 2	C 3	C 4	C 5	D 1	D 2	D 3	D 4	D 5
01 F4 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 F4 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 F4 47	0	0	0	0	0	[illegible]	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 F4 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 F4 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 F4 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 F4 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 F4 52	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 G3 01	1	25	2	0	0	0	35	1	0	0	1	39	0	0	0	0	18	0	0	0
01 G3 02	4	45	0	0	0	4	19	0	0	0	3	14	0	0	0	1	11	0	0	0
01 G3 03	9	16	0	0	0	5	13	0	0	0	0	12	0	0	0	2	11	0	2	0
01 G3 04	2	12	1	0	0	5	15	1	0	0	6	8	0	0	0	5	13	0	0	0
01 G3 05	0	12	0	0	0	4	7	0	0	0	17	5	0	1	0	6	10	0	0	0
01 G3 06	8	6	0	0	0	2	8	0	0	0	26	7	0	0	0	5	5	0	0	0
01 G3 07	19	6	0	0	0	14	2	0	0	0	13	5	0	0	0	9	5	0	0	0
01 G3 08	6	3	1	0	0	3	5	0	1	0	7	4	0	0	0	13	2	0	0	0
01 G3 09	3	2	0	0	0	6	2	1	0	0	3	6	0	0	0	7	1	0	0	0
01 G3 10	3	0	0	0	0	4	2	0	0	0	8	3	0	0	0	5	0	1	0	0
01 G3 11	0	2	0	0	0	5	6	0	0	0	4	6	0	0	0	3	3	0	0	0
01 G3 12	1	0	0	0	0	1	2	0	0	0	2	1	1	0	0	4	6	0	0	0
01 G3 13	2	0	1	0	0	0	1	0	0	0	0	3	0	0	0	3	3	0	0	0
01 G3 14	1	4	0	0	0	1	0	0	0	0	3	2	0	0	0	0	2	0	0	0
01 G3 15	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	6	4	0	0	0
01 G3 16	0	1	0	0	0	1	2	0	0	0	0	0	0	0	0	0	8	0	0	0
01 G3 17	0	3	0	0	0	0	0	0	0	0	0	1	0	0	0	3	6	0	0	0
01 G3 18	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
01 G3 19	3	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0
01 G3 20	3	9	0	0	0	0	1	0	0	0	0	1	0	0	0	1	1	0	0	0
01 G3 21	0	9	0	0	0	1	1	0	0	0	0	0	0	0	0	0	2	0	0	0
01 G3 22	1	5	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0
01 G3 23	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 G3 24	0	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 G3 25	0	4	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
01 G3 26	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 G3 27	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
01 G3 28	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 G3 29	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
01 G3 30	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 G3 31	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
01 G3 32	0	0	1	0	0	0	2	0	0	0	0	0	2	0	0	0	0	0	0	0
01 G3 33	0	1	0	0	0	0	2	0	0	0	0	7	0	0	0	0	6	0	0	0
01 G3 34	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	6	0	0	0

APPENDIX I. *Continued*

Subplot			A					B					C					D		
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
01 G3 35	0	1	0	0	0	0	1	0	0	0	0	4	0	0	0	0	12	0	0	0
01 G3 36	0	0	0	0	0	0	1	0	0	0	0	3	0	0	0	0	1	0	0	0
01 G3 37	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
01 G3 38	0	0	0	0	0	0	3	0	0	0	0	4	0	0	0	0	0	0	0	0
01 G3 39	0	0	0	0	0	0	4	0	1	0	0	3	1	1	0	0	0	1	0	0
01 G3 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
01 G3 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 G3 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 G3 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 G3 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 G3 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 G3 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 G3 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 G3 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 G3 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 G3 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 G3 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 G3 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 H3 01	3	8	0	0	1	4	25	0	0	0	4	13	0	0	0	3	7	1	0	0
01 H3 02	9	10	0	0	0	2	6	2	0	0	5	25	0	0	0	4	7	0	0	0
01 H3 03	3	4	0	1	0	6	17	0	0	0	2	11	0	0	0	0	6	1	0	0
01 H3 04	3	5	1	0	0	3	4	0	0	0	4	5	1	0	0	0	4	0	0	0
01 H3 05	1	2	0	0	1	5	10	0	0	0	4	7	0	0	0	2	3	0	1	0
01 H3 06	2	5	1	0	0	1	7	0	0	0	1	4	1	0	0	1	4	1	0	0
01 H3 07	1	3	0	0	0	0	5	0	0	0	0	2	0	0	0	0	2	0	0	0
01 H3 08	0	1	0	0	0	0	1	0	0	0	2	4	0	0	0	0	4	0	0	0
01 H3 09	0	7	0	0	0	1	5	0	0	0	0	3	0	0	0	3	4	0	0	0
01 H3 10	0	1	0	0	0	0	3	0	0	0	0	4	0	0	0	0	6	0	0	0
01 H3 11	0	2	0	0	0	0	4	0	0	0	0	1	0	0	0	0	3	0	0	0
01 H3 12	1	3	0	0	0	1	3	0	0	0	0	3	0	0	0	0	0	0	0	0
01 H3 13	0	0	0	0	0	0	5	0	0	0	0	9	0	0	0	0	1	0	0	0
01 H3 14	0	4	0	0	0	0	5	0	0	0	0	5	0	0	0	0	0	0	0	0
01 H3 15	2	4	0	0	0	1	6	0	0	0	0	2	0	0	0	1	2	0	0	0
01 H3 16	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0
01 H3 17	1	0	0	0	0	1	6	0	0	0	0	3	0	0	0	1	1	0	0	0
01 H3 18	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
01 H3 19	0	4	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0
01 H3 20	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
01 H3 21	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
01 H3 22	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
01 H3 23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 H3 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
01 H3 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 H3 26	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
01 H3 27	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
01 H3 28	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
01 H3 29	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
01 H3 30	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0
01 H3 31	0	0	0	0	0	0	7	0	0	0	0	2	0	0	0	0	0	0	0	0
01 H3 32	0	5	0	0	0	0	6	0	0	0	0	7	0	0	0	1	1	0	0	0
01 H3 33	0	4	0	0	0	0	6	0	0	0	0	4	0	0	0	0	4	0	0	0
01 H3 34	0	4	1	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
01 H3 35	0	4	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
01 H3 36	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 H3 37	0	6	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
01 H3 38	0	3	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
01 H3 39	0	2	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0
01 H3 40	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
01 H3 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 H3 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 H3 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 H3 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 H3 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 H3 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 H3 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 H3 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 H3 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 H3 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 H3 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01 H3 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 C1 01	6	0	0	0	1	15	2	0	0	0	7	2	1	0	0	6	0	0	0	0
02 C1 02	4	8	0	0	0	8	5	1	0	0	11	4	0	0	1	7	1	0	0	0
02 C1 03	11	4	0	0	0	4	4	2	0	0	5	4	2	0	0	10	3	0	0	0
02 C1 04	18	4	0	0	0	12	2	0	0	0	5	1	0	0	0	8	0	0	0	0
02 C1 05	4	3	0	0	0	7	3	0	0	0	7	4	1	0	0	8	1	0	0	0
02 C1 06	16	0	0	0	0	5	2	0	0	0	6	0	0	0	0	6	3	0	0	0
02 C1 07	5	1	0	0	0	3	1	0	0	0	8	2	1	0	0	2	4	0	0	0
02 C1 08	8	1	0	0	0	4	2	0	0	0	2	1	0	0	0	2	1	0	0	0
02 C1 09	10	2	0	0	0	2	3	0	0	0	3	5	0	0	0	2	2	0	0	0
02 C1 10	0	0	0	0	0	0	0	0	0	0	1	3	0	0	0	1	1	0	0	0
02 C1 11	3	1	0	0	0	2	0	0	0	0	3	1	0	0	0	1	0	1	0	0
02 C1 12	2	2	0	0	0	3	0	0	0	0	5	0	0	0	0	2	1	0	0	0
02 C1 13	2	0	0	0	0	3	2	0	0	0	2	0	0	0	0	2	1	0	0	0
02 C1 14	1	0	0	0	0	3	0	0	0	0	3	0	0	0	0	5	0	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
02 C1 15	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
02 C1 16	0	1	0	0	0	3	0	0	0	0	2	0	0	0	0	1	0	0	0	0
02 C1 17	1	1	0	0	0	4	0	0	0	0	1	1	0	0	0	0	0	0	0	0
02 C1 18	6	1	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 C1 19	3	0	0	0	0	5	0	0	0	0	3	0	0	0	0	1	0	0	0	0
02 C1 20	4	0	0	0	0	1	1	0	0	0	2	0	0	0	0	1	0	0	0	0
02 C1 21	2	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
02 C1 22	0	0	0	0	0	2	0	0	0	0	3	0	0	0	0	3	0	0	0	0
02 C1 23	2	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	1	0	0	0
02 C1 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
02 C1 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
02 C1 26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
02 C1 27	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	0
02 C1 28	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
02 C1 29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 C1 30	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
02 C1 31	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 C1 32	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0
02 C1 33	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
02 C1 34	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
02 C1 35	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
02 C1 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 C1 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
02 C1 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 C1 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 C1 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 C1 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 C1 42	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 C1 43	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0
02 C1 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 C1 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 C1 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 C1 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 C1 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 C1 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 C1 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 C1 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 C1 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 C1 53	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
02 C1 54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 C1 55	0	1	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0
02 C1 56	0	3	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
02 C1 57	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
02 C1 58	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	3	0	0	0
02 C1 59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 C1 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 C1 61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 C1 62	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
02 C1 63	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	3	0	0	0
02 C1 64	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
02 C1 65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 C1 66	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 C1 67	2	2	0	0	0	2	3	0	0	0	2	1	0	0	0	3	0	0	0	0
02 C1 68	0	1	0	0	0	0	2	0	0	0	1	4	0	0	0	1	3	0	0	0
02 C1 69	0	0	0	0	0	0	1	0	0	0	0	4	0	0	0	0	2	0	0	0
02 C1 70	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	3	0	0	0
02 C1 71	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0
02 C1 72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 C1 73	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0
02 C1 74	0	0	0	0	0	0	6	0	0	0	0	3	0	0	0	0	1	0	0	0
02 C1 75	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
02 C1 76	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	3	0	0	0
02 C1 77	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3	0	0	0
02 C1 78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
02 C1 79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
02 C1 80	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 01	20	2	1	0	0	18	4	0	0	0	38	0	0	0	0	10	2	0	0	0
02 D2 02	14	3	1	0	0	8	4	0	0	0	17	3	1	0	0	3	5	2	0	0
02 D2 03	10	11	2	0	0	3	8	1	1	0	18	9	0	0	0	7	8	1	0	0
02 D2 04	4	2	0	0	1	6	9	3	0	0	7	7	2	1	0	7	3	3	0	0
02 D2 05	0	7	0	0	0	6	4	0	1	0	6	4	3	1	0	8	2	1	1	0
02 D2 06	4	6	1	0	0	6	7	0	0	0	7	4	0	0	0	3	6	2	0	0
02 D2 07	2	3	0	0	0	2	6	0	0	0	1	3	1	0	0	2	7	0	0	1
02 D2 08	0	3	0	0	0	2	7	0	0	0	3	3	0	0	0	5	4	0	0	0
02 D2 09	1	3	0	0	0	0	3	0	0	0	4	3	0	0	0	2	5	0	0	0
02 D2 10	2	3	0	0	0	0	3	0	0	0	4	3	0	0	0	2	2	0	0	0
02 D2 11	0	3	1	0	0	3	3	0	0	0	0	4	0	0	0	2	4	0	0	0
02 D2 12	0	2	1	0	0	2	1	0	0	0	0	4	0	0	0	1	2	0	0	0
02 D2 13	3	7	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 14	0	9	0	0	0	1	3	0	0	0	0	5	0	0	0	0	1	0	0	0
02 D2 15	1	7	0	0	0	2	13	0	0	0	0	6	0	0	0	0	3	0	0	0
02 D2 16	2	11	0	0	0	4	6	0	0	0	0	0	0	0	0	0	1	0	0	0
02 D2 17	3	5	0	0	0	1	8	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 18	0	1	0	0	0	4	10	0	0	0	0	1	0	0	0	0	1	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
02 D2 19	0	0	0	0	0	2	7	0	0	0	0	3	0	0	0	1	0	0	0	0
02 D2 20	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0
02 D2 21	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 22	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 23	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 53	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
02 D2 54	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 55	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 56	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
02 D2 57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
02 D2 58	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0
02 D2 59	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
02 D2 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot			A					B					C					D		
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
02 D2 61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
02 D2 65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 D2 67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 E3 01	6	7	0	0	0	3	11	0	0	0	3	4	0	0	0	2	6	0	0	0
02 E3 02	4	20	0	0	0	4	17	0	0	0	3	18	0	0	0	2	11	0	0	0
02 E3 03	1	19	0	0	0	3	22	0	0	0	5	16	0	0	0	4	8	1	0	0
02 E3 04	7	21	0	0	0	1	18	3	0	0	2	16	1	0	0	3	8	2	0	0
02 E3 05	3	21	1	0	0	1	14	2	0	0	0	20	0	0	0	2	7	0	0	1
02 E3 06	0	15	0	0	0	3	11	0	0	0	0	17	0	0	0	2	12	0	0	0
02 E3 07	3	14	0	0	0	3	6	0	0	0	2	14	1	0	0	0	14	0	0	0
02 E3 08	0	18	0	0	0	5	7	0	0	0	2	8	0	0	0	4	25	0	0	0
02 E3 09	1	8	0	0	0	4	4	0	0	0	1	12	0	0	0	2	13	0	0	0
02 E3 10	1	6	0	0	0	3	8	0	0	0	1	10	0	0	0	2	10	0	0	0
02 E3 11	0	4	0	0	0	0	1	0	0	0	2	8	0	0	0	4	3	0	0	0
02 E3 12	4	2	0	0	0	0	1	0	0	0	1	2	0	0	0	1	0	0	0	0
02 E3 13	2	0	0	0	0	0	0	0	0	0	1	4	0	0	0	5	0	0	0	0
02 E3 14	0	3	0	0	0	1	0	0	0	0	1	5	0	0	0	1	0	0	0	0
02 E3 15	0	1	0	0	0	0	0	1	0	0	0	4	0	0	0	0	1	0	0	0
02 E3 16	1	4	0	0	0	0	2	0	0	0	0	5	0	0	0	1	0	0	0	0
02 E3 17	1	2	0	0	0	0	0	0	0	0	0	9	0	0	0	0	3	0	0	0
02 E3 18	0	1	0	0	0	0	0	0	0	0	0	12	0	0	0	0	5	0	0	0
02 E3 19	1	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	3	0	0	0
02 E3 20	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0
02 E3 21	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	0	5	0	0	0
02 E3 22	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	4	0	0	0
02 E3 23	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0
02 E3 24	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
02 E3 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 E3 26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 E3 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 E3 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 E3 29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 E3 30	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
02 E3 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 E3 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 E3 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 E3 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 E3 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
02 E3 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 E3 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 E3 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 E3 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 E3 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 E3 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 E3 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 E3 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 E3 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 E3 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 E3 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 E3 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 E3 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 E3 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 E3 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 E3 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 E3 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 01	2	16	0	0	0	10	25	1	1	0	8	23	0	0	0	14	9	0	0	0
02 F2 02	3	22	0	0	0	9	18	0	0	0	7	4	0	0	0	3	10	0	1	0
02 F2 03	6	7	0	0	0	7	13	0	0	0	5	5	0	0	0	1	5	2	0	0
02 F2 04	4	9	0	0	0	4	7	0	1	0	5	6	1	0	0	3	9	0	0	0
02 F2 05	4	4	2	0	0	7	6	0	0	0	5	5	2	0	0	3	6	1	0	0
02 F2 06	3	8	0	0	0	2	6	1	0	0	2	4	1	0	0	4	6	0	0	0
02 F2 07	2	6	0	0	0	1	2	0	0	0	1	3	0	0	0	0	2	0	0	0
02 F2 08	4	3	0	1	0	2	1	0	0	0	0	1	0	0	0	0	3	0	0	0
02 F2 09	5	0	0	0	0	3	4	0	0	0	0	3	0	0	0	0	0	0	0	0
02 F2 10	7	3	0	0	0	3	9	0	0	0	0	4	0	0	0	0	2	0	0	0
02 F2 11	6	2	0	0	0	0	3	0	0	0	0	0	0	0	0	5	3	0	0	0
02 F2 12	2	5	1	0	0	0	4	0	0	0	0	0	0	0	0	0	1	0	0	0
02 F2 13	3	9	0	0	0	0	9	0	0	0	1	4	0	0	0	0	0	0	0	0
02 F2 14	0	12	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 15	0	14	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 16	2	12	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 17	1	10	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 18	0	11	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 19	0	2	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
02 F2 26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 52	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 53	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
02 F2 54	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F2 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 01	5	20	0	0	0	2	14	0	0	0	0	13	1	0	0	2	4	0	0	0
02 F3 02	2	18	1	0	0	5	18	0	0	0	1	30	1	0	0	1	25	0	0	0
02 F3 03	2	18	0	0	0	2	32	0	0	0	3	21	1	0	0	2	30	0	0	0
02 F3 04	5	14	0	0	0	4	12	2	0	1	5	12	0	0	0	3	8	0	0	0
02 F3 05	3	17	0	0	0	4	22	1	0	0	4	20	0	0	0	2	36	0	0	0
02 F3 06	0	5	1	0	0	0	9	1	0	0	6	9	0	0	0	4	16	1	0	1
02 F3 07	1	2	0	0	0	5	6	0	0	0	13	3	1	0	0	5	3	3	0	0

APPENDIX I. *Continued*

Subplot			A					B					C					D		
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
02 F3 08,	3	1	0	0	0	3	4	1	0	0	3	7	0	0	0	0	4	0	0	0
02 F3 09	0	2	0	0	0	4	4	0	0	0	2	1	0	0	0	0	1	0	0	0
02 F3 10	2	2	0	0	0	1	2	0	0	0	0	0	0	0	0	0	2	0	0	0
02 F3 11	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0	2	0	0	0
02 F3 12	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	3	0	0	0
02 F3 13	0	1	0	0	0	0	4	0	0	0	0	1	0	0	0	0	4	0	0	0
02 F3 14	0	1	0	0	0	1	3	0	0	0	0	0	0	0	0	0	5	0	0	0
02 F3 15	0	3	0	0	0	0	2	0	0	0	0	3	0	0	0	0	2	0	0	0
02 F3 16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 17	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
02 F3 19	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0
02 F3 20	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0
02 F3 21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
02 F3 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 F3 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 01	12	4	2	0	1	13	13	1	0	0	6	10	1	0	0	2	12	0	0	0
02 G3 02	6	12	0	0	0	47	19	0	0	0	18	20	0	1	0	6	11	1	0	0
02 G3 03	5	6	0	0	0	3	15	0	1	0	10	8	1	0	0	5	20	0	0	0
02 G3 04	1	10	0	0	0	0	15	0	0	0	2	18	1	0	0	3	16	0	0	0
02 G3 05	1	11	0	0	0	1	9	0	0	0	1	24	0	0	0	0	9	0	0	0
02 G3 06	1	7	0	0	0	3	4	0	0	0	4	8	1	0	0	4	1	2	0	0
02 G3 07	0	3	0	0	0	0	3	0	0	0	1	4	0	0	0	1	4	0	0	0
02 G3 08	2	3	0	0	0	0	8	0	0	0	2	1	0	0	0	0	9	0	1	0
02 G3 09	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	6	0	0	0
02 G3 10	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	2	1	0	0
02 G3 11	1	0	0	0	0	2	0	0	0	0	0	3	0	0	0	0	0	0	0	0
02 G3 12	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
02 G3 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
02 G3 15	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 16	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 17	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
02 G3 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 44	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
02 G3 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 47	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
02 G3 48	0	2	0	0	0	0	4	0	0	0	0	1	0	0	0	0	1	0	0	0
02 G3 49	0	3	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 50	0	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0
02 G3 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
02 G3 52	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
02 G3 53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 G3 57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 J4 01	5	25	0	0	1	7	25	1	0	0	4	33	0	0	0	4	13	0	0	0
02 J4 02	10	13	1	0	0	13	12	0	0	0	6	24	0	1	0	7	14	0	0	0
02 J4 03	3	15	0	0	0	2	31	0	0	0	7	17	0	0	0	3	13	0	1	0
02 J4 04	8	10	1	1	0	6	22	0	0	0	5	9	0	0	0	1	13	0	0	0
02 J4 05	5	10	0	0	0	1	10	0	0	0	6	15	0	1	0	8	14	0	0	0
02 J4 06	1	12	0	0	0	2	12	0	0	0	2	16	0	0	0	4	10	0	0	0
02 J4 07	2	11	0	0	0	1	8	0	1	0	12	14	0	0	0	2	6	0	0	0
02 J4 08	1	13	0	0	0	1	13	0	0	0	2	7	0	0	0	3	8	0	0	0
02 J4 09	5	7	0	0	0	2	11	0	0	0	3	0	0	0	0	3	4	0	0	0
02 J4 10	1	3	0	0	0	0	5	1	0	0	0	1	0	0	0	1	0	0	0	0
02 J4 11	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0	0	1	0	0	0
02 J4 12	0	0	0	0	0	0	5	0	0	0	3	5	0	0	0	0	1	0	0	0
02 J4 13	0	8	0	0	0	0	4	0	0	0	0	1	0	0	0	0	1	0	0	0
02 J4 14	0	0	0	0	0	1	9	0	0	0	1	1	0	0	0	2	3	0	0	0
02 J4 15	0	2	0	0	0	1	7	0	0	0	1	2	0	0	0	2	2	0	0	0
02 J4 16	0	1	0	0	0	4	3	0	0	0	1	1	0	0	0	1	0	0	0	0
02 J4 17	0	2	0	0	0	0	3	0	0	0	0	2	0	0	0	2	0	0	0	0
02 J4 18	1	6	0	0	0	1	1	0	0	0	0	3	0	0	0	0	3	0	0	0
02 J4 19	0	7	0	0	0	1	6	0	0	0	1	6	0	0	0	0	2	0	0	0
02 J4 20	0	2	0	0	0	1	5	0	0	0	1	5	0	0	0	0	0	0	0	0
02 J4 21	0	1	0	0	0	7	3	0	0	0	2	2	0	0	0	0	0	0	0	0
02 J4 22	2	1	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0
02 J4 23	0	4	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0
02 J4 24	2	0	0	0	0	3	1	0	0	0	2	4	0	0	0	6	4	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
02 J4 25	2	1	0	0	0	1	5	0	0	0	0	0	0	0	0	2	1	0	0	0
02 J4 26	0	3	0	0	0	1	2	0	0	1	0	3	0	0	0	0	0	0	0	0
02 J4 27	5	2	0	0	0	13	7	0	0	0	3	3	0	0	0	0	0	0	0	0
02 J4 28	4	7	0	0	0	1	7	0	0	0	0	1	0	0	0	0	0	0	0	0
02 J4 29	0	2	0	0	0	0	2	0	0	0	1	0	0	0	0	0	2	0	0	0
02 J4 30	0	4	0	0	0	0	4	0	0	0	4	13	0	0	0	2	1	0	0	0
02 J4 31	0	2	0	0	0	0	0	0	0	0	2	6	0	0	0	0	2	0	0	0
02 J4 32	0	0	0	0	0	0	1	1	0	0	0	5	0	0	0	0	0	0	0	0
02 J4 33	0	0	0	0	0	1	0	1	0	0	3	4	0	0	0	0	1	0	0	0
02 J4 34	0	1	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0
02 J4 35	0	3	0	0	0	0	1	0	0	0	1	6	0	0	0	0	2	0	0	0
02 J4 36	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	3	0	0	0
02 J4 37	0	2	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0
02 J4 38	0	4	0	0	0	0	1	0	0	0	0	3	0	0	0	0	0	0	0	0
02 J4 39	0	1	0	0	0	0	3	0	0	0	0	2	0	0	0	0	0	0	0	0
02 J4 40	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0
02 J4 41	0	4	0	0	0	0	2	0	0	0	0	5	0	2	0	0	1	1	0	0
02 J4 42	0	2	0	0	0	0	2	0	0	0	0	3	0	1	0	0	0	0	0	0
02 J4 43	0	2	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0
02 J4 44	0	2	1	0	0	0	3	0	0	0	0	2	0	0	0	0	0	0	0	0
02 J4 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 J4 46	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 J4 47	0	3	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
02 J4 48	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
02 J4 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 J4 50	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02 J4 51	0	5	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0
02 J4 52	0	7	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
03 C1 01	0	18	0	1	0	0	18	0	0	0	1	9	0	0	0	0	15	1	0	0
03 C1 02	5	35	0	0	0	11	36	0	0	0	4	18	2	0	0	10	28	1	1	0
03 C1 03	8	31	2	2	1	3	17	0	0	0	4	13	0	0	0	2	10	2	1	0
03 C1 04	4	29	0	0	0	7	15	2	1	0	1	9	0	0	1	3	12	0	0	0
03 C1 05	3	11	0	0	0	3	20	0	0	0	0	9	0	0	0	0	4	0	0	0
03 C1 06	2	8	0	0	0	0	10	0	0	0	0	16	0	0	0	0	15	0	0	0
03 C1 07	0	3	0	0	0	0	6	0	0	0	0	8	0	0	0	1	12	0	0	0
03 C1 08	0	1	0	0	0	0	2	0	0	0	0	6	0	0	0	0	7	0	0	0
03 C1 09	0	1	0	0	0	0	1	0	0	0	0	2	0	0	0	0	2	0	0	0
03 C1 10	0	5	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	0
03 C1 11	0	7	0	0	0	0	8	0	0	0	0	4	0	0	0	0	0	0	0	0
03 C1 12	0	7	0	0	0	0	6	0	0	0	1	6	0	0	0	1	0	0	0	0
03 C1 13	1	7	0	0	0	0	9	0	0	0	1	16	0	0	0	1	3	0	0	0
03 C1 14	0	5	0	0	0	1	12	0	0	0	1	7	0	0	0	0	3	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
03 C1 15	0	13	0	0	0	1	7	0	0	0	0	1	0	0	0	1	0	0	0	0
03 C1 16	2	2	0	0	0	1	3	0	0	0	1	12	0	0	0	1	6	0	0	0
03 C1 17	1	3	0	0	0	0	8	0	0	0	1	3	0	0	0	0	9	0	0	0
03 C1 18	2	1	0	0	0	2	4	0	0	0	0	0	0	0	0	0	2	0	0	0
03 C1 19	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0
03 C1 20	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	12	0	0	0
03 C1 21	0	4	0	0	0	0	0	0	0	0	0	12	0	0	0	1	1	0	0	0
03 C1 22	0	0	0	0	0	0	0	0	0	0	0	3	0	1	0	0	1	0	0	0
03 C1 23	1	1	0	0	0	0	2	0	0	0	0	2	0	0	0	0	3	0	0	0
03 C1 24	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0
03 C1 25	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	3	0	0	0
03 C1 26	0	0	0	0	0	1	8	0	0	0	0	0	0	0	0	0	4	0	0	0
03 C1 27	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0
03 C1 28	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0
03 C1 29	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	5	0	0	0
03 C1 30	0	0	0	0	0	0	5	0	0	0	0	1	0	0	0	0	0	0	0	0
03 C1 31	0	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0	2	0	0	0
03 C1 32	0	0	0	0	0	0	1	0	0	0	0	12	0	0	0	0	2	0	0	0
03 C1 33	0	1	0	0	0	0	3	0	0	0	0	6	0	0	0	0	1	0	0	0
03 C1 34	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0
03 C1 35	0	0	0	0	0	0	6	0	0	0	1	3	0	0	0	0	15	0	0	0
03 C1 36	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0
03 C1 37	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	2	0	0	0
03 C1 38	0	1	0	0	0	0	1	0	1	0	0	2	0	0	0	0	3	0	0	0
03 C1 39	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0
03 C1 40	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0
03 C1 41	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	2	1	0	0
03 C1 42	0	1	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	1	0	0
03 C1 43	0	3	0	1	0	1	4	0	0	0	0	2	0	0	0	0	18	0	0	0
03 C1 44	0	2	0	0	0	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0
03 C1 45	0	8	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0
03 C1 46	0	6	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
03 C1 47	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 C1 48	0	6	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
03 C1 49	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 C1 50	0	1	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0
03 C1 51	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
03 C1 52	0	5	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
03 D4 01	0	7	0	0	0	0	9	1	0	0	0	12	1	0	0	0	3	0	1	0
03 D4 02	0	3	0	0	0	3	16	1	0	0	2	23	0	0	0	1	17	0	0	0
03 D4 03	0	8	0	1	0	0	16	1	0	0	0	27	0	0	0	3	43	0	0	0
03 D4 04	0	12	0	0	0	1	19	0	0	0	1	15	0	0	0	3	29	1	0	0

APPENDIX I. *Continued*

Subplot			A					B					C					D		
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
03 D4 05	0	17	0	0	0	0	14	0	2	0	0	18	0	1	0	1	24	1	0	0
03 D4 06	0	16	0	0	0	1	13	0	0	0	0	8	0	1	0	1	13	0	0	0
03 D4 07	0	9	0	0	0	1	18	0	0	0	2	12	0	0	0	1	7	0	0	0
03 D4 08	0	9	0	0	0	0	17	0	0	0	0	17	0	0	0	0	8	0	0	0
03 D4 09	0	12	1	0	0	0	7	0	0	0	1	9	0	0	0	0	13	0	0	0
03 D4 10	0	13	0	0	0	0	6	1	0	0	0	10	0	0	0	0	7	0	0	0
03 D4 11	0	5	0	0	0	0	7	0	0	0	1	1	0	0	0	0	6	0	0	0
03 D4 12	0	6	0	0	0	0	13	0	0	0	0	4	0	0	0	0	9	0	0	0
03 D4 13	0	14	0	0	0	0	21	0	0	0	1	12	0	0	0	2	0	0	0	0
03 D4 14	0	24	0	0	0	0	7	0	0	0	0	4	0	0	0	0	2	0	0	0
03 D4 15	0	13	1	0	0	0	16	0	0	0	0	1	0	0	0	0	11	0	0	0
03 D4 16	0	8	0	0	0	0	1	0	0	0	0	4	0	0	0	0	4	0	0	0
03 D4 17	0	2	0	0	0	0	3	0	0	0	0	3	0	0	0	1	4	0	0	0
03 D4 18	0	0	0	0	0	0	4	0	0	0	0	2	0	0	0	0	0	0	0	0
03 D4 19	0	3	0	0	0	0	6	0	0	0	0	1	0	0	0	0	1	0	0	0
03 D4 20	0	4	0	0	0	0	5	0	0	0	0	1	0	0	0	0	1	0	0	0
03 D4 21	0	3	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
03 D4 22	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
03 D4 23	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
03 D4 24	0	3	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
03 D4 25	0	10	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
03 D4 26	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	4	0	0	0
03 D4 27	0	3	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0
03 D4 28	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	3	0	0	0
03 D4 29	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
03 D4 30	0	2	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0
03 D4 31	0	1	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0
03 D4 32	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	1	1	0	0	0
03 D4 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0
03 D4 34	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
03 D4 35	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
03 D4 36	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
03 D4 37	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
03 D4 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 D4 39	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
03 D4 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 D4 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
03 D4 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 D4 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 D4 44	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
03 D4 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 D4 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
03 D4 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 D4 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 D4 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 D4 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 D4 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 D4 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 E4 01	2	9	1	0	0	0	16	0	0	0	2	11	0	0	0	3	4	0	0	0
03 E4 02	1	15	0	0	0	2	18	0	0	0	1	25	0	0	0	1	12	0	0	0
03 E4 03	1	11	0	0	0	0	9	0	1	1	2	29	0	0	0	2	8	1	0	0
03 E4 04	2	11	0	0	0	1	10	0	0	0	3	9	0	0	0	1	3	0	0	0
03 E4 05	2	13	0	0	0	3	8	1	0	1	1	12	0	0	0	4	4	0	0	1
03 E4 06	2	17	0	0	0	1	6	1	0	0	0	15	0	0	1	2	12	0	0	1
03 E4 07	2	25	0	0	1	2	13	0	0	0	1	14	0	0	0	1	7	0	0	0
03 E4 08	0	14	0	0	0	2	12	0	0	0	3	13	0	1	0	2	5	0	0	0
03 E4 09	2	16	0	0	0	2	11	0	0	0	0	10	0	0	0	2	9	0	0	0
03 E4 10	1	13	0	0	0	1	19	0	0	0	3	10	0	0	0	0	9	0	0	0
03 E4 11	1	7	1	0	0	2	14	0	0	0	0	5	0	0	0	0	6	0	0	0
03 E4 12	0	5	0	0	0	3	6	0	0	0	0	6	0	0	0	0	8	0	0	0
08 E4 13	3	6	0	0	0	0	4	0	0	0	0	7	0	1	0	1	7	0	0	0
03 E4 14	3	7	0	0	0	2	9	0	0	0	1	1	0	0	0	1	6	0	0	0
03 E4 15	0	2	0	0	0	0	6	0	0	0	0	3	0	0	0	1	2	0	0	0
03 E4 16	0	2	0	0	0	0	7	0	0	0	1	1	0	0	0	1	1	0	0	0
03 E4 17	1	2	0	0	0	0	7	0	0	0	0	4	0	0	0	0	1	0	0	0
03 E4 18	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	1	0	0	0
03 E4 19	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0	1	0	0	0
03 E4 20	0	3	0	0	0	1	6	0	0	0	0	5	0	0	0	0	0	0	0	0
03 E4 21	0	1	0	0	0	0	2	0	0	0	0	0	0	1	0	0	1	0	0	0
03 E4 22	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0
03 E4 23	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
03 E4 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
03 E4 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
03 E4 26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 E4 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
03 E4 28	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	0
03 E4 29	0	1	0	0	0	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0
03 E4 30	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0
03 E4 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 E4 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 E4 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 E4 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 E4 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 E4 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
03 E4 37	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0
03 E4 38	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
03 E4 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 E4 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 E4 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 E4 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 E4 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
03 E4 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 E4 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 E4 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 E4 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 E4 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
03 E4 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 E4 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 E4 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 E4 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 F3 01	1	10	0	0	0	2	12	0	0	0	4	16	0	0	0	0	15	0	0	0
03 F3 02	2	14	0	0	0	2	15	0	0	0	2	35	0	0	0	1	15	1	0	0
03 F3 03	1	10	0	0	0	2	12	1	0	0	3	8	0	0	0	1	18	0	0	0
03 F3 04	0	17	0	0	0	0	7	0	0	0	1	11	1	0	0	0	10	0	0	0
03 F3 05	1	3	0	0	0	0	11	0	1	0	1	12	0	0	0	1	7	0	0	0
03 F3 06	1	7	0	0	0	5	7	0	0	0	4	7	1	1	0	1	7	1	1	0
03 F3 07	0	5	0	0	0	1	25	0	0	0	4	7	0	0	0	0	5	1	0	0
03 F3 08	2	9	0	0	0	3	26	0	0	0	2	8	0	0	0	1	2	0	0	0
03 F3 09	0	4	0	0	0	2	4	0	0	1	0	5	0	0	1	3	2	0	1	0
03 F3 10	1	3	0	0	0	1	3	0	0	0	1	6	0	0	0	1	3	0	0	0
03 F3 11	0	5	0	0	0	0	6	0	0	0	0	6	0	0	0	8	1	0	0	0
03 F3 12	0	12	0	0	0	0	2	0	0	0	1	5	0	0	0	1	5	0	0	0
03 F3 13	0	3	0	0	0	0	2	0	0	0	0	7	0	0	0	0	4	0	0	0
03 F3 14	1	2	0	0	0	1	3	0	0	0	1	0	0	0	0	0	0	0	0	0
03 F3 15	1	1	0	0	0	1	5	0	0	0	1	0	0	0	0	0	4	0	0	0
03 F3 16	1	0	0	0	0	2	1	0	0	0	0	0	0	0	1	0	1	0	0	0
03 F3 17	0	2	0	0	0	0	1	0	0	0	0	0	0	1	0	0	2	0	0	0
03 F3 18	0	5	0	0	0	1	0	0	0	0	0	0	0	0	0	0	3	0	0	0
03 F3 19	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	4	0	0	0
03 F3 20	5	3	0	0	0	2	1	0	0	0	0	1	0	0	0	0	5	0	0	0
03 F3 21	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
03 F3 22	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
03 F3 23	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
03 F3 24	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
03 F3 25	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 F3 26	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
03 F3 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 F3 28	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
03 F3 29	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
03 F3 30	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
03 F3 31	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
03 F3 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 F3 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 F3 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 F3 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 F3 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 F3 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 F3 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 F3 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
03 F3 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
03 F3 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 F3 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 F3 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 F3 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 F3 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 F3 46	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0
03 F3 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 F3 48	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
03 F3 49	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
03 F3 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 F3 51	0	.8	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
03 F3 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 G1 01	0	5	0	0	0	0	5	1	0	0	0	5	0	0	0	0	3	0	0	0
03 G1 02	0	12	0	0	0	1	6	0	0	0	0	3	1	0	0	0	6	1	0	0
03 G1 03	2	43	0	0	0	1	44	0	0	0	0	19	0	0	0	0	17	0	2	0
03 G1 04	2	22	0	0	0	2	24	0	1	1	0	30	0	0	0	0	12	0	1	0
03 G1 05	7	17	1	0	0	2	17	0	0	0	3	15	1	0	0	4	17	0	0	0
03 G1 06	1	5	0	1	0	4	5	0	0	0	5	5	0	0	0	7	14	0	0	0
03 G1 07	7	9	0	0	0	2	8	0	0	0	7	9	0	0	0	4	19	0	0	0
03 G1 08	1	5	0	0	0	1	1	1	0	0	0	3	0	0	0	4	7	0	0	0
03 G1 09	1	5	0	0	0	1	1	0	0	0	1	6	0	0	0	0	4	10	0	0
03 G1 10	0	3	0	0	0	2	2	0	0	0	3	1	0	0	0	0	4	0	0	0
03 G1 11	3	4	0	0	0	1	5	0	0	0	0	2	0	0	0	2	5	0	0	0
03 G1 12	1	7	0	1	0	4	4	0	0	0	0	2	0	0	0	0	4	0	0	0
03 G1 13	0	8	0	0	0	1	6	0	0	0	0	5	0	0	0	0	3	0	0	0
03 G1 14	0	5	0	0	0	0	1	0	0	0	0	2	0	0	0	0	2	0	0	0
03 G1 15	0	5	0	0	0	0	8	0	0	0	0	1	0	0	0	0	4	0	0	0
03 G1 16	1	9	0	0	0	0	2	0	0	0	5	2	0	0	0	1	4	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
03 G1 17	0	5	1	0	0	0	0	0	0	0	2	2	0	0	0	1	3	0	0	0
03 G1 18	2	7	0	0	0	2	4	0	0	0	0	0	0	0	0	0	1	0	0	0
03 G1 19	2	5	0	0	0	1	2	0	0	0	0	0	0	0	0	0	1	0	0	0
03 G1 20	0	11	0	0	0	2	3	0	0	0	0	4	0	0	0	3	1	0	0	0
03 G1 21	1	12	0	0	0	0	5	0	0	0	0	9	0	0	0	0	6	0	0	0
03 G1 22	2	8	0	0	0	0	10	0	0	0	0	5	0	0	0	1	4	0	0	0
03 G1 23	6	4	0	1	0	3	18	0	0	0	1	4	0	0	0	0	5	0	0	0
03 G1 24	0	17	0	0	0	1	8	0	0	0	0	3	0	0	0	1	2	0	0	0
03 G1 25	4	12	0	0	0	1	4	0	0	0	0	2	0	0	0	0	0	0	0	0
03 G1 26	2	9	0	0	0	1	1	0	0	0	0	4	0	0	0	0	1	0	0	0
03 G1 27	2	8	0	0	0	0	0	0	0	0	0	4	0	0	0	0	1	0	0	0
03 G1 28	6	7	0	0	0	3	0	0	0	0	0	7	0	0	0	0	3	0	0	0
03 G1 29	5	4	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
03 G1 30	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
03 G1 31	3	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
03 G1 32	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
03 G1 33	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
03 G1 34	1	4	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
03 G1 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
03 G1 36	1	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
03 G1 37	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 G1 38	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 G1 39	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 G1 40	0	4	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
03 G1 41	0	5	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
03 G1 42	0	1	0	0	0	0	5	0	0	0	0	13	0	0	0	0	1	0	0	0
03 G1 43	0	0	0	0	0	0	5	0	0	0	1	6	0	0	0	0	0	0	0	0
03 G1 44	0	0	0	0	0	0	7	1	0	0	0	4	0	0	0	0	0	0	0	0
03 G1 45	0	1	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
03 G1 46	0	1	0	0	0	0	2	0	0	0	0	3	0	0	0	0	0	0	0	0
03 G1 47	0	1	0	0	0	0	11	0	0	0	0	10	0	0	0	0	0	0	0	0
03 G1 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 G1 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 G1 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 G1 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 G1 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H2 01	4	15	1	0	0	4	9	0	0	0	1	9	0	0	0	3	6	1	0	0
03 H2 02	4	25	0	0	0	4	14	0	0	0	2	15	1	0	0	4	9	0	0	0
03 H2 03	2	15	0	0	0	4	12	0	0	1	6	8	0	0	0	6	7	0	0	0
03 H2 04	5	14	1	0	0	3	13	0	0	0	6	11	0	0	0	9	3	0	0	0
03 H2 05	1	29	2	0	0	0	8	0	0	0	10	16	0	0	0	4	9	0	0	0
03 H2 06	4	15	0	0	0	0	1	0	0	2	1	6	0	0	0	2	14	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
03 H2 07	4	16	1	0	0	8	6	0	0	0	3	5	0	1	1	3	10	1	0	0
03 H2 08	1.	14	0	0	0	7	10	0	0	0	4	12	0	0	0	3	9	0	0	0
03 H2 09	11	1	0	0	0	1	5	0	0	0	3	12	0	0	0	4	12	0	0	0
03 H2 10	2	4	0	0	0	3	6	0	0	0	3	12	0	0	0	7	8	1	0	0
03 H2 11	3	7	0	0	0	0	6	0	0	0	2	3	0	1	0	4	15	0	0	0
03 H2 12	0	4	0	0	0	0	4	0	0	0	3	4	0	0	0	5	3	0	0	0
03 H2 13	0	2	1	0	0	0	0	0	0	0	0	7	0	1	0	0	0	1	0	0
03 H2 14	0	5	0	0	0	0	6	0	0	0	0	4	0	1	0	1	4	0	0	0
03 H2 15	1	6	1	0	0	3	4	0	0	0	2	1	0	1	0	0	5	0	0	0
03 H2 16	1	13	0	0	0	2	5	0	0	0	0	2	0	0	0	2	4	0	0	0
03 H2 17	0	5	0	0	0	2	2	1	0	0	1	0	0	0	0	2	0	0	0	0
03 H2 18	0	4	0	0	0	0	0	0	0	0	3	0	0	0	0	0	6	0	0	0
03 H2 19	2	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	3	0	0	0
03 H2 20	2	1	0	0	0	0	3	0	0	0	0	2	0	0	0	0	2	0	0	0
03 H2 21	0	2	0	0	0	0	1	0	0	0	0	1	0	0	0	0	3	0	0	0
03 H2 22	1	4	0	0	0	4	1	0	0	0	0	4	0	1	0	0	1	0	0	0
03 H2 23	1	3	0	0	0	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0
03 H2 24	0	2	0	0	0	0	1	0	0	0	2	1	0	0	0	0	0	0	0	0
03 H2 25	0	3	0	0	0	0	4	0	0	0	2	1	0	0	0	0	0	0	0	0
03 H2 26	0	1	0	0	0	0	2	0	0	0	0	3	0	0	0	0	0	0	0	0
03 H2 27	0	1	0	0	0	0	1	0	0	0	2	2	0	0	0	0	0	0	0	0
03 H2 28	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
03 H2 29	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
03 H2 30	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H2 31	0	5	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
03 H2 32	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
03 H2 33	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H2 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H2 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H2 36	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
03 H2 37	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
03 H2 38	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
03 H2 39	0	0	0	0	0	0	1	0	0	0	0	4	0	0	0	0	3	0	0	0
03 H2 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
03 H2 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
03 H2 42	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	3	0	0	0
03 H2 43	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	3	0	0	0
03 H2 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
03 H2 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
03 H2 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
03 H2 47	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
03 H2 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
03 H2 49	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
03 H2 50	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
03 H2 51	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
03 H2 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H4 01	0	18	0	0	0	3	13	0	0	0	1	25	0	0	0	1	10	0	0	0
03 H4 02	1	38	0	0	0	0	27	0	0	0	1	29	0	0	0	0	15	1	0	0
03 H4 03	1	31	1	0	0	0	17	1	0	0	0	30	3	0	1	0	29	3	0	0
03 H4 04	0	10	0	0	0	1	15	1	0	0	2	18	1	0	0	1	21	1	0	0
03 H4 05	1	10	0	1	0	0	15	0	0	0	0	16	0	1	0	0	20	1	0	0
03 H4 06	0	13	0	0	0	4	14	0	0	0	0	14	0	0	0	0	21	0	0	0
03 H4 07	0	9	0	0	0	0	7	0	0	0	2	2	0	0	0	0	16	0	0	0
03 H4 08	0	6	0	0	0	2	9	0	0	0	0	6	1	0	0	1	13	0	0	0
03 H4 09	0	4	0	0	0	0	8	0	0	0	0	9	0	0	0	0	9	0	0	0
03 H4 10	0	9	0	0	0	0	10	0	0	0	2	9	0	0	0	0	6	0	0	0
03 H4 11	0	11	0	0	0	0	15	1	1	0	2	17	0	1	0	0	14	0	1	0
03 H4 12	0	13	0	0	0	0	6	0	2	0	0	14	1	1	0	0	20	0	0	0
03 H4 13	0	7	0	0	0	0	9	0	1	0	1	32	0	0	0	2	26	0	0	0
03 H4 14	1	7	0	0	0	0	10	0	0	0	1	25	0	0	0	0	16	0	0	0
03 H4 15	0	17	0	0	0	0	9	0	0	0	0	19	0	0	0	1	16	0	0	0
03 H4 16	0	6	0	0	0	0	14	0	0	0	0	17	0	0	0	1	15	0	0	0
03 H4 17	0	3	0	0	0	0	11	0	0	0	1	16	0	0	0	0	3	0	0	0
03 H4 18	0	8	0	0	0	0	7	0	0	0	2	10	0	0	0	0	1	0	0	0
03 H4 19	0	1	0	0	0	0	4	0	0	0	0	4	0	0	0	0	3	0	0	0
03 H4 20	1	6	0	0	0	0	11	1	0	0	0	3	0	0	0	0	0	0	0	0
03 H4 21	0	1	0	0	0	0	4	0	0	0	0	0	0	0	0	0	1	0	0	0
03 H4 22	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0	0	1	0	0	0
03 H4 23	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H4 24	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H4 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H4 26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H4 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H4 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H4 29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H4 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H4 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H4 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H4 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H4 34	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H4 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H4 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H4 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H4 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A 1	A 2	A 3	A 4	A 5	B 1	B 2	B 3	B 4	B 5	C 1	C 2	C 3	C 4	C 5	D 1	D 2	D 3	D 4	D 5
03 H4 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H4 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H4 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H4 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H4 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H4 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H4 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H4 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H4 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H4 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H4 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H4 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03 H4 51	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0
03 H4 52	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0
04 C1 01	0	10	0	1	0	0	3	0	0	0	0	3	0	0	1	0	11	1	1	0
04 C1 02	0	8	0	0	0	0	8	0	0	0	2	11	0	0	0	1	13	0	0	0
04 C1 03	1	3	0	1	1	3	5	0	1	0	1	18	1	0	0	2	7	0	0	0
04 C1 04	2	12	1	0	1	2	10	1	0	0	2	6	1	0	0	1	2	1	0	0
04 C1 05	1	6	1	0	0	2	6	0	0	0	0	8	1	0	0	1	5	0	0	0
04 C1 06	1	5	0	0	0	1	6	1	0	0	1	8	0	2	0	1	9	0	0	0
04 C1 07	1	0	0	0	0	1	4	0	0	0	0	5	0	0	0	0	9	0	0	0
04 C1 08	0	3	0	0	0	1	4	0	0	0	1	4	2	1	0	1	2	0	0	1
04 C1 09	2	3	0	0	0	1	6	0	0	0	0	6	0	0	0	0	2	0	0	0
04 C1 10	2	4	0	0	0	2	2	0	0	0	1	3	0	0	0	1	5	1	0	0
04 C1 11	1	4	0	0	0	0	2	0	0	0	2	1	0	0	0	0	3	1	0	0
04 C1 12	0	7	0	0	0	0	4	0	0	0	4	3	2	0	0	2	9	0	0	0
04 C1 13	3	7	0	1	0	1	6	0	0	0	3	3	0	1	0	0	3	1	0	0
04 C1 14	0	1	0	0	0	0	1	0	1	0	1	1	0	0	0	1	4	0	0	0
04 C1 15	1	0	1	0	0	0	0	0	0	0	4	0	0	0	0	1	0	0	0	0
04 C1 16	1	1	0	0	0	0	1	0	0	0	1	1	0	0	1	2	0	0	0	0
04 C1 17	1	0	0	2	0	1	2	1	0	0	0	1	1	0	0	1	1	0	0	0
04 C1 18	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0
04 C1 19	3	1	0	0	0	0	0	0	1	0	0	2	0	1	0	1	0	0	0	0
04 C1 20	0	1	0	0	0	1	1	1	0	0	0	2	1	0	0	0	1	0	0	0
04 C1 21	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
04 C1 22	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
04 C1 23	0	1	0	0	0	0	1	0	0	0	0	8	1	0	0	0	0	0	0	0
04 C1 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 C1 25	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	2	0	0	0
04 C1 26	0	0	0	0	0	0	1	0	0	0	0	3	0	0	0	0	0	0	0	0
04 C1 27	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
04 C1 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
04 C1 29	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
04 C1 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 C1 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 C1 32	0	0	0	0	0	3	0	2	0	0	0	1	0	0	0	0	0	0	0	0
04 C1 33	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
04 C1 34	0	1	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
04 C1 35	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0
04 C1 36	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0
04 C1 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 C1 38	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0
04 C1 39	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
04 C1 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 C1 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 C1 42	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
04 C1 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 C1 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 C1 45	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
04 C1 46	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
04 C1 47	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 C1 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
04 C1 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 C1 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 C1 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 C1 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 C2 01	1	18	0	1	0	2	16	1	0	1	0	19	0	0	0	2	9	0	1	1
04 C2 02	2	15	0	0	1	1	15	1	0	0	3	25	0	0	0	2	26	0	0	0
04 C2 03	0	6	0	0	0	0	14	0	0	0	1	21	0	0	0	2	12	0	0	0
04 C2 04	0	7	0	1	0	0	6	0	0	0	1	4	0	1	0	0	11	1	0	0
04 C2 05	1	7	1	0	0	1	3	0	0	0	1	3	0	0	0	1	1	0	0	0
04 C2 06	1	7	0	0	0	3	5	0	0	0	2	3	0	0	0	2	1	0	0	0
04 C2 07	2	12	0	0	0	0	7	0	0	0	2	4	0	0	0	0	1	0	0	0
04 C2 08	2	10	1	0	0	3	9	0	0	0	2	4	0	0	0	1	4	0	0	0
04 C2 09	2	10	1	0	0	2	8	1	0	0	1	4	0	0	0	2	3	0	0	0
04 C2 10	1	4	0	0	0	0	3	0	0	0	4	4	0	0	0	1	8	0	0	0
04 C2 11	4	9	0	0	0	2	5	0	0	0	1	7	0	0	0	2	5	0	0	0
04 C2 12	1	5	0	0	0	0	6	0	0	0	1	5	0	0	0	1	4	0	0	0
04 C2 13	2	2	0	0	0	0	7	0	0	0	2	12	0	0	0	1	12	1	0	0
04 C2 14	0	3	0	0	0	0	3	0	0	0	0	12	0	0	0	0	17	0	0	0
04 C2 15	1	2	0	0	0	1	1	0	0	0	0	7	0	0	0	0	9	0	0	0
04 C2 16	0	2	0	0	0	0	3	0	0	0	0	7	0	0	0	0	5	0	0	0
04 C2 17	0	6	0	0	0	1	5	0	0	0	2	7	0	0	0	0	4	0	0	0
04 C2 18	0	3	0	0	0	2	3	0	0	0	1	7	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot			A					B					C					D		
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
04 C2 19	0	3	0	0	0	2	2	0	0	0	0	3	0	0	0	3	1	0	0	0
04 C2 20	0	2	0	1	0	4	1	0	0	0	1	3	0	0	0	0	0	0	0	0
04 C2 21	0	1	0	0	0	3	0	0	0	0	2	6	0	0	0	0	0	0	0	0
04 C2 22	0	1	0	0	0	1	2	0	0	0	0	9	0	0	0	1	0	0	0	0
04 C2 23	0	0	0	0	0	1	0	0	0	0	2	4	0	0	0	1	2	0	0	0
04 C2 24	0	1	0	0	0	0	0	0	0	0	0	5	0	0	0	1	0	0	0	0
04 C2 25	0	3	0	0	0	0	4	0	0	0	0	5	0	0	0	1	1	0	0	0
04 C2 26	0	3	0	0	0	0	1	0	0	0	0	2	0	0	0	0	1	0	0	0
04 C2 27	0	7	0	0	0	0	1	0	0	0	1	3	0	0	0	0	2	0	0	0
04 C2 28	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0
04 C2 29	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 C2 30	0	2	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
04 C2 31	0	1	0	0	0	0	4	0	0	0	0	1	0	0	0	0	0	0	0	0
04 C2 32	0	0	0	0	0	0	3	0	0	0	0	3	0	0	0	0	1	0	0	0
04 C2 33	0	1	0	0	0	0	4	0	0	0	0	1	0	0	0	0	1	0	0	0
04 C2 34	0	0	0	0	0	1	2	0	0	0	1	0	0	0	0	1	7	0	0	0
04 C2 35	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0	15	0	0	0
04 C2 36	3	4	2	0	0	1	2	0	0	0	1	4	0	0	0	2	7	0	0	0
04 C2 37	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	3	0	0	0	0
04 C2 38	3	2	0	0	0	0	4	0	0	0	2	1	0	0	0	0	2	0	0	0
04 C2 39	3	8	0	0	0	0	8	0	0	0	0	2	0	0	0	0	5	0	0	0
04 C2 40	0	6	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0
04 C2 41	1	4	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	0	0	0
04 C2 42	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
04 C2 43	0	1	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0
04 C2 44	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
04 C2 45	0	3	0	0	0	0	4	0	0	0	0	1	0	0	0	0	0	0	0	0
04 C2 46	0	1	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
04 C2 47	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 C2 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 C2 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 C2 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 C2 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 C2 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 E3 01	0	13	2	1	0	0	7	0	0	0	1	4	1	0	3	1	6	0	1	0
04 E3 02	0	5	1	0	0	1	5	0	0	0	2	13	0	0	0	1	10	0	0	0
04 E3 03	1	13	0	0	0	1	29	0	0	0	0	39	0	0	0	2	12	1	0	0
04 E3 04	0	12	1	0	0	1	11	0	0	0	0	20	0	0	0	1	11	0	0	0
04 E3 05	0	13	0	0	0	1	2	0	0	0	1	17	0	0	0	0	12	0	0	0
04 E3 06	2	6	0	0	0	8	5	0	0	0	3	16	0	0	0	2	13	0	0	0
04 E3 07	1	8	0	0	0	9	13	0	0	0	1	15	0	0	0	1	7	1	0	0
04 E3 08	3	3	0	0	0	4	10	0	0	0	3	4	1	0	0	1	3	0	0	0

APPENDIX I. *Continued*

Subplot			A					B					C					D		
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
04 E3 09	2	2	0	0	0	4	10	0	0	0	3	11	1	0	0	7	1	0	0	0
04 E3 10	1	2	0	0	0	4	3	1	0	0	1	1	0	0	0	3	1	0	0	0
04 E3 11	7	4	0	0	0	3	1	0	0	0	0	5	0	0	0	0	4	0	0	0
04 E3 12	2	1	0	0	0	5	5	0	0	0	2	3	0	0	0	3	3	1	2	0
04 E3 13	1	3	0	0	0	1	3	0	0	0	3	3	0	0	0	2	1	0	0	0
04 E3 14	2	1	0	0	0	1	2	0	0	0	2	4	0	0	0	1	1	0	0	0
04 E3 15	3	4	0	0	0	2	2	0	0	0	1	8	0	0	0	3	2	0	0	0
04 E3 16	4	0	0	0	0	3	7	0	0	0	0	12	1	0	0	1	3	0	0	0
04 E3 17	1	5	0	0	0	2	3	0	0	0	8	2	0	0	0	1	0	0	0	0
04 E3 18	0	1	0	0	0	0	2	0	0	0	2	1	0	0	0	2	2	0	0	0
04 E3 19	0	2	0	0	0	2	5	0	0	0	2	3	0	0	0	0	3	0	0	0
04 E3 20	1	3	0	0	0	1	5	0	0	0	0	2	0	0	0	2	0	0	0	0
04 E3 21	0	7	1	0	0	0	6	0	0	0	0	1	0	0	0	1	1	0	0	0
04 E3 22	0	4	0	0	0	0	2	0	0	0	2	2	0	0	0	2	2	0	0	0
04 E3 23	0	2	0	0	0	0	1	0	0	0	0	2	0	0	0	0	1	0	0	0
04 E3 24	1	0	0	0	0	[illegible]	2	0	0	0	0	3	0	0	0	0	0	0	0	0
04 E3 25	2	1	0	0	0	2	1	0	0	0	0	3	1	0	0	0	0	0	0	0
04 E3 26	0	5	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0
04 E3 27	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 E3 28	0	2	0	0	0	0	5	0	0	0	0	5	0	0	0	0	0	0	0	0
04 E3 29	0	1	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
04 E3 30	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	0	0	0
04 E3 31	1	3	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0
04 E3 32	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
04 E3 33	1	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
04 E3 34	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	1	0	0
04 E3 35	1	2	0	0	0	0	0	0	0	0	0	2	0	0	0	0	3	0	0	0
04 E3 36	2	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
04 E3 37	0	3	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
04 E3 38	0	2	0	0	0	0	1	0	0	0	0	1	0	0	0	0	2	0	0	0
04 E3 39	0	3	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
04 E3 40	0	6	0	0	0	1	2	0	0	0	0	4	0	0	0	0	1	0	0	0
04 E3 41	0	0	0	0	0	0	16	0	0	0	0	7	0	0	0	0	0	0	0	0
04 E3 42	0	7	0	0	0	0	5	0	0	0	0	10	0	0	0	0	5	0	0	0
04 E3 43	1	0	0	0	0	0	2	0	0	0	0	5	0	0	0	0	1	0	0	0
04 E3 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
04 E3 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 E3 46	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
04 E3 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 E3 48	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 E3 49	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
04 E3 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
04 E3 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 E3 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 F2 01	0	9	0	0	1	0	5	0	1	0	0	4	1	0	0	0	11	4	0	0
04 F2 02	0	9	1	0	0	1	12	1	0	0	0	6	0	0	1	0	7	1	2	1
04 F2 03	1	17	0	0	0	2	13	0	0	0	2	13	0	0	0	0	3	1	1	0
04 F2 04	2	14	0	1	0	2	14	0	0	0	2	5	0	0	0	0	10	3	1	0
04 F2 05	0	17	0	0	0	0	17	0	0	0	2	3	1	0	0	0	9	0	0	0
04 F2 06	0	8	3	0	0	0	19	0	0	0	3	9	0	0	0	0	9	0	0	0
04 F2 07	0	20	0	0	0	1	25	0	0	0	6	15	0	0	0	0	6	0	0	0
04 F2 08	2	17	0	0	0	0	13	0	0	0	0	8	0	0	0	0	5	0	0	0
04 F2 09	2	11	0	0	0	4	31	0	0	0	2	19	0	0	0	2	11	0	0	0
04 F2 10	2	11	0	0	0	0	11	0	0	0	2	9	0	0	0	0	4	0	0	0
04 F2 11	0	9	0	0	0	0	15	0	1	0	0	6	0	0	0	2	3	0	0	0
04 F2 12	0	8	0	0	0	6	0	0	1	0	0	4	0	0	0	0	2	0	0	0
04 F2 13	0	6	0	0	0	0	7	0	0	0	0	9	1	1	0	2	5	0	0	0
04 F2 14	0	0	0	0	0	0	8	0	0	0	3	7	0	0	0	0	1	0	0	0
04 F2 15	0	2	0	1	0	0	7	0	0	0	0	4	0	0	0	0	0	0	0	0
04 F2 16	0	7	0	0	0	0	1	0	0	0	0	3	0	0	0	2	5	0	0	0
04 F2 17	0	6	0	0	0	0	2	0	0	0	0	2	0	0	0	0	7	0	0	0
04 F2 18	0	2	0	0	0	0	1	0	0	0	0	6	0	0	0	1	7	1	0	0
04 F2 19	0	5	0	0	0	0	1	0	0	0	0	4	0	0	0	0	2	0	0	0
04 F2 20	0	4	0	0	0	0	2	0	0	0	0	6	0	0	0	0	4	0	0	0
04 F2 21	0	5	0	0	0	0	1	0	0	0	0	4	0	0	0	0	0	0	0	0
04 F2 22	0	1	0	0	0	0	2	1	0	0	0	2	0	0	0	0	1	0	0	0
04 F2 23	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	4	0	0	0
04 F2 24	0	2	0	0	0	0	2	0	0	0	0	1	0	0	0	0	1	0	0	0
04 F2 25	0	2	0	0	0	0	4	0	0	0	0	0	0	0	0	0	3	0	0	0
04 F2 26	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0
04 F2 27	0	2	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0
04 F2 28	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
04 F2 29	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0
04 F2 30	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
04 F2 31	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
04 F2 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 F2 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 F2 34	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 F2 35	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
04 F2 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 F2 37	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
04 F2 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
04 F2 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 F2 40	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
04 F2 41	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
04 F2 42	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0
04 F2 43	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	1	0	0	0
04 F2 44	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0	0	2	0	0	0
04 F2 45	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	5	0	0	0
04 F2 46	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	6	0	0	0
04 F2 47	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	3	0	0	0
04 F2 48	0	1	0	0	0	0	1	0	0	0	0	6	0	0	0	0	2	0	0	0
04 F2 49	0	0	0	0	0	0	4	0	0	0	0	6	0	0	0	0	0	0	0	0
04 F2 50	0	0	0	0	0	0	3	0	0	0	0	3	0	0	0	0	3	0	0	0
04 F2 51	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	3	0	0	0
04 F2 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
04 H1 01	1	7	0	2	0	0	15	0	0	0	0	12	1	0	0	0	14	0	0	0
04 H1 02	1	15	0	0	0	2	17	1	2	1	4	9	0	1	1	3	4	0	1	1
04 H1 03	1	12	4	0	0	2	20	0	0	0	1	15	0	0	0	0	8	0	0	0
04 H1 04	3	13	0	1	0	10	15	0	0	0	2	18	0	0	0	2	16	0	0	0
04 H1 05	3	11	0	0	0	5	15	1	0	0	4	14	0	0	0	4	13	0	0	0
04 H1 06	7	12	0	1	0	0	24	0	0	0	2	17	0	0	0	2	5	1	0	0
04 H1 07	1	17	1	0	0	0	28	0	0	0	5	16	1	0	0	1	14	1	0	0
04 H1 08	1	15	0	0	0	1	14	0	0	0	2	11	0	0	0	0	14	0	0	0
04 H1 09	5	18	0	1	0	0	15	0	0	0	0	17	0	0	0	2	16	0	0	0
04 H1 10	3	25	0	0	0	3	17	0	0	0	2	19	1	0	0	0	15	1	0	0
04 H1 11	1	16	0	0	0	3	18	0	0	0	3	31	0	0	0	0	10	0	0	0
04 H1 12	2	18	0	0	0	7	18	0	0	0	3	14	0	0	0	2	15	0	0	0
04 H1 13	1	16	0	0	0	1	17	0	0	0	2	9	0	0	0	2	21	0	0	0
04 H1 14	6	9	0	0	0	5	15	0	0	0	5	14	0	0	0	3	5	0	0	0
04 H1 15	3	9	0	0	0	1	4	1	0	0	6	9	0	0	0	2	7	0	0	0
04 H1 16	0	6	0	0	0	2	6	0	0	0	2	7	0	0	0	1	4	0	0	0
04 H1 17	0	7	0	0	0	2	1	0	0	0	1	2	0	0	0	1	2	0	0	0
04 H1 18	0	5	0	0	0	0	2	0	0	0	2	1	0	0	0	2	0	0	0	0
04 H1 19	1	5	1	0	0	1	2	0	0	0	1	2	0	0	0	1	4	0	0	0
04 H1 20	2	11	0	0	0	0	1	0	0	0	1	0	0	0	0	0	5	0	0	0
04 H1 21	2	7	1	0	0	0	1	0	0	0	0	2	0	0	0	0	5	1	0	0
04 H1 22	0	16	0	0	0	0	2	0	0	0	3	5	0	0	0	1	4	0	0	0
04 H1 23	2	13	0	0	0	3	1	0	0	0	1	3	0	0	0	3	4	0	0	0
04 H1 24	1	8	0	0	0	0	3	0	0	0	1	3	0	0	0	0	1	0	0	0
04 H1 25	1	7	0	0	0	0	5	0	0	0	0	3	0	0	0	0	1	1	0	0
04 H1 26	0	4	0	0	0	0	1	0	0	0	2	3	0	0	0	5	1	0	0	0
04 H1 27	0	1	0	0	0	0	4	0	0	0	3	9	0	0	0	1	6	0	0	0
04 H1 28	2	0	0	0	0	0	3	0	0	0	0	7	0	0	0	0	5	0	0	0
04 H1 29	1	1	0	0	0	1	3	0	0	0	0	4	0	0	0	0	7	0	0	0
04 H1 30	2	3	0	0	0	2	3	1	0	0	0	6	0	0	0	0	5	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
04 H1 31	0	1	0	0	0	0	4	0	0	0	3	12	0	0	0	0	3	0	0	0
04 H1 32	0	2	0	0	0	1	9	0	0	0	1	8	0	0	0	0	0	0	0	0
04 H1 33	0	12	1	0	0	0	3	0	0	0	1	2	0	0	0	3	1	0	0	0
04 H1 34	0	8	0	0	0	0	1	2	0	0	0	4	0	0	0	0	5	0	0	0
04 H1 35	3	4	0	0	0	0	2	0	0	0	1	0	0	0	0	0	1	0	0	0
04 H1 36	0	5	0	0	0	3	3	0	0	0	1	0	0	0	0	0	1	0	0	0
04 H1 37	0	6	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0
04 H1 38	0	4	0	0	0	2	5	0	0	0	0	1	0	0	0	0	2	0	0	0
04 H1 39	3	20	0	0	0	0	21	0	0	0	2	5	0	0	0	0	0	0	0	0
04 H1 40	0	6	0	0	0	4	8	0	0	0	1	1	0	0	0	0	1	0	0	0
04 H1 41	0	8	0	0	0	2	8	0	0	0	1	5	0	0	0	0	1	0	0	0
04 H1 42	3	6	0	0	0	0	14	0	0	0	3	2	0	0	0	0	1	0	0	0
04 H1 43	1	5	0	0	0	0	3	0	0	0	2	0	0	0	0	0	0	0	0	0
04 H1 44	0	5	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
04 H1 45	0	4	0	0	0	1	5	0	0	0	0	0	0	0	0	0	2	0	0	0
04 H1 46	0	6	0	0	0	4	11	0	0	0	2	0	2	0	0	0	1	0	0	0
04 H1 47	0	0	0	0	0	0	10	0	0	0	0	3	1	0	0	1	2	0	0	0
04 H1 48	1	1	0	0	0	0	3	0	0	0	0	13	0	0	0	0	1	0	0	0
04 H1 49	0	1	0	0	0	1	5	0	0	0	0	5	0	0	0	0	1	0	0	0
04 H1 50	0	1	0	0	0	0	8	0	0	0	0	5	1	0	0	0	3	0	0	0
04 H1 51	0	0	0	1	0	0	5	0	0	0	1	9	0	0	0	0	5	1	0	0
04 H1 52	0	0	0	0	0	0	3	0	0	0	0	3	0	0	0	1	9	0	0	0
04 J1 01	0	33	1	1	2	0	14	0	0	0	2	18	0	0	2	0	12	1	1	1
04 J1 02	0	17	0	1	0	0	19	0	0	0	0	5	0	1	0	0	4	1	0	0
04 J1 03	0	11	0	0	0	0	8	0	0	0	0	8	0	0	0	0	6	0	0	0
04 J1 04	2	8	0	0	0	1	2	0	0	1	2	5	0	0	0	0	6	0	0	1
04 J1 05	4	3	0	0	0	2	3	0	0	0	1	5	0	0	1	0	8	0	0	0
04 J1 06	1	4	1	0	0	1	5	0	0	0	0	11	0	0	0	0	5	0	0	0
04 J1 07	1	5	0	0	0	0	10	0	0	0	0	7	0	0	0	1	20	0	0	0
04 J1 08	1	11	0	0	0	0	1	1	0	0	0	5	0	0	0	0	13	0	0	0
04 J1 09	0	17	0	0	0	0	6	0	0	0	0	4	0	0	0	1	2	0	0	0
04 J1 10	0	8	0	0	0	0	5	0	0	0	0	9	0	0	0	0	5	0	0	0
04 J1 11	0	2	0	0	0	0	5	0	0	0	0	8	1	0	0	0	6	1	0	0
04 J1 12	0	4	1	0	0	0	5	0	0	0	0	2	0	0	0	1	7	0	0	0
04 J1 13	0	3	0	0	0	0	0	0	0	0	0	4	1	0	0	0	8	0	0	0
04 J1 14	0	6	0	0	0	0	3	0	0	0	1	3	1	1	0	0	5	0	0	0
04 J1 15	0	4	0	0	0	0	1	0	0	0	0	5	0	0	0	0	3	0	0	0
04 J1 16	0	2	0	0	0	0	2	0	0	0	0	3	0	0	0	1	4	0	0	0
04 J1 17	0	2	0	0	0	1	3	0	0	1	0	6	0	0	0	0	8	0	0	0
04 J1 18	0	5	0	0	0	0	0	0	0	0	0	3	1	0	0	0	1	0	0	0
04 J1 19	0	3	0	0	0	0	0	0	0	0	0	1	0	0	0	1	3	0	0	0
04 J1 20	0	1	0	0	0	0	2	0	0	0	0	6	0	0	0	0	4	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
04 J1 21	0	1	0	0	0	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0
04 J1 22	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
04 J1 23	0	1	0	0	0	0	3	0	0	0	0	3	0	0	0	0	0	0	0	0
04 J1 24	0	3	0	0	0	0	1	0	0	0	0	2	0	0	0	0	1	0	0	0
04 J1 25	0	2	0	0	0	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0
04 J1 26	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
04 J1 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
04 J1 28	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0	0	1	0	0	0
04 J1 29	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0
04 J1 30	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
04 J1 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 J1 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
04 J1 33	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0
04 J1 34	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
04 J1 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 J1 36	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
04 J1 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 J1 38	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
04 J1 39	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 J1 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 J1 41	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 J1 42	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0
04 J1 43	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	2	0	0	0
04 J1 44	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
04 J1 45	0	1	0	0	0	0	3	0	0	0	0	1	0	0	0	0	2	0	0	0
04 J1 46	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
04 J1 47	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
04 J1 48	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
04 J1 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 J1 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 J1 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 J1 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 K3 01	3	9	1	0	2	1	15	0	0	0	2	16	0	1	1	1	0	0	0	1
04 K3 02	0	15	1	0	0	1	12	0	0	0	4	14	0	0	0	0	8	0	0	0
04 K3 03	3	20	1	0	0	2	20	1	0	0	3	16	2	0	0	2	18	0	0	0
04 K3 04	0	11	1	0	0	2	19	0	0	0	1	11	1	0	0	2	18	0	0	0
04 K3 05	0	12	1	0	1	7	9	0	0	0	1	8	1	0	0	1	9	0	0	0
04 K3 06	1	3	1	0	0	1	21	1	0	0	2	6	0	0	0	3	7	0	0	0
04 K3 07	1	3	0	0	0	7	21	0	1	0	2	7	0	0	0	2	12	0	0	0
04 K3 08	3	8	0	0	0	11	6	0	0	0	5	8	0	0	0	2	9	0	0	0
04 K3 09	5	3	0	0	0	11	10	0	0	0	6	9	0	0	0	3	6	0	0	0
04 K3 10	4	3	0	0	0	8	13	0	0	0	6	9	0	0	0	1	4	0	0	0

APPENDIX I. *Continued*

Subplot	A 1	A 2	A 3	A 4	A 5	B 1	B 2	B 3	B 4	B 5	C 1	C 2	C 3	C 4	C 5	D 1	D 2	D 3	D 4	D 5
04 K3 11	1	2	0	0	0	6	11	0	0	0	2	4	0	0	0	1	5	0	0	0
04 K3 12	0	5	0	0	0	4	6	0	0	0	1	10	0	0	0	2	13	0	0	0
04 K3 13	2	10	0	0	0	2	4	0	0	0	3	3	0	0	0	3	14	0	0	0
04 K3 14	2	11	0	0	0	4	7	0	0	0	4	6	0	0	0	1	5	0	0	0
04 K3 15	2	5	0	1	0	2	6	0	0	0	2	5	0	0	0	2	5	0	0	0
04 K3 16	1	8	0	0	0	1	9	0	0	0	19	12	0	0	0	10	6	0	0	0
04 K3 17	1	0	0	1	0	0	2	0	0	0	3	6	0	0	0	7	9	0	0	0
04 K3 18	0	2	0	0	0	0	7	0	0	0	0	1	0	0	0	1	6	0	0	0
04 K3 19	0	1	0	0	0	0	7	0	0	0	0	2	0	0	0	0	0	0	0	0
04 K3 20	2	5	1	0	0	0	13	0	0	0	0	3	0	0	0	1	4	0	0	0
04 K3 21	2	0	2	0	0	0	1	1	0	0	1	1	0	0	0	1	4	1	0	0
04 K3 22	0	3	0	0	0	0	2	0	0	0	1	4	0	0	0	1	2	1	0	0
04 K3 23	0	1	0	0	0	0	2	0	0	0	0	4	0	0	0	1	2	0	0	0
04 K3 24	0	1	0	0	0	0	7	1	0	0	0	2	0	0	0	1	2	0	0	0
04 K3 25	0	1	0	0	0	1	6	0	0	0	0	0	0	0	0	0	2	0	0	0
04 K3 26	0	0	0	0	0	0	4	0	0	0	1	1	0	0	0	0	0	0	0	0
04 K3 27	0	0	0	0	0	0	2	0	0	0	1	1	0	0	0	0	0	0	0	0
04 K3 28	4	4	0	0	0	1	2	0	0	0	3	2	0	0	0	1	0	0	0	0
04 K3 29	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	2	6	0	0	0
04 K3 30	3	8	0	0	0	2	0	0	0	0	0	4	0	0	0	4	3	0	0	0
04 K3 31	2	3	0	0	0	0	0	0	0	0	6	3	0	0	0	5	1	0	1	0
04 K3 32	3	3	0	0	0	0	2	1	0	0	9	1	1	0	0	2	0	0	0	0
04 K3 33	3	2	0	0	0	1	1	0	0	0	2	2	0	0	0	4	0	0	0	0
04 K3 34	0	4	0	0	0	2	2	0	0	0	2	1	0	0	0	2	2	0	0	0
04 K3 35	1	3	0	0	0	0	3	0	0	0	0	1	0	0	0	1	2	1	0	0
04 K3 36	4	1	0	0	0	2	0	0	0	0	1	1	0	0	0	0	0	0	0	0
04 K3 37	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
04 K3 38	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
04 K3 39	3	7	0	0	0	2	0	0	0	0	3	0	0	0	0	2	1	0	0	0
04 K3 40	1	4	0	0	0	0	4	0	0	0	0	5	0	0	0	2	0	1	0	0
04 K3 41	2	1	0	0	0	0	1	0	0	0	1	3	0	0	0	1	6	0	0	0
04 K3 42	0	1	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0
04 K3 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 K3 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 K3 45	0	6	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
04 K3 46	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 K3 47	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 K3 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 K3 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 K3 50	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 K3 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04 K3 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
05 B3 01	0	20	0	0	0	2	5	0	0	0	3	13	0	0	0	2	29	0	0	0
05 B3 02	3	25	1	0	0	2	14	1	0	0	1	40	5	0	0	0	20	2	0	0
05 B3 03	2	25	0	0	0	2	15	1	0	0	1	14	1	0	0	2	12	1	0	0
05 B3 04	0	7	0	0	0	2	6	0	1	0	0	9	0	0	0	4	13	1	0	0
05 B3 05	0	9	0	0	0	0	10	1	0	0	2	8	0	1	0	0	11	0	0	0
05 B3 06	0	2	0	1	0	0	3	0	0	0	0	9	0	0	0	0	16	0	0	0
05 B3 07	1	6	0	0	0	0	3	1	0	0	1	16	0	0	0	2	18	0	0	0
05 B3 08	0	7	0	0	0	2	10	0	1	0	0	8	0	0	0	0	9	1	0	0
05 B3 09	0	6	0	0	0	0	4	0	1	0	0	7	0	0	0	1	3	0	0	0
05 B3 10	0	5	0	0	0	1	2	0	0	0	0	3	0	0	0	0	1	0	0	0
05 B3 11	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	3	2	0	0	0
05 B3 12	0	5	0	0	0	0	3	0	0	0	0	0	0	0	0	0	4	0	0	0
05 B3 13	0	4	0	0	0	0	5	0	0	0	0	3	0	0	0	0	2	0	0	0
05 B3 14	0	6	0	0	0	0	8	0	0	0	3	9	0	0	0	0	4	1	0	0
05 B3 15	0	5	0	0	0	0	7	0	0	0	0	9	0	0	0	0	1	0	0	0
05 B3 16	0	2	0	0	0	0	2	0	0	0	0	2	0	0	0	0	1	0	0	0
05 B3 17	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
05 B3 18	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0	0	1	0	0	0
05 B3 19	0	6	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
05 B3 20	0	7	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
05 B3 21	0	4	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
05 B3 22	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0
05 B3 23	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
05 B3 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 B3 25	0	0	0	0	0	0	3	0	0	0	0	2	0	0	0	0	0	0	0	0
05 B3 26	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
05 B3 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 B3 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
05 B3 29	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0
05 B3 30	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0
05 B3 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
05 B3 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
05 B3 33	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
05 B3 34	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 B3 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 B3 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 B3 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 B3 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 B3 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 B3 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 C1 01	3	12	0	0	0	1	27	0	0	0	0	23	0	1	0	0	16	0	1	0
05 C1 02	1	13	1	1	0	0	24	1	0	0	3	17	0	0	0	0	14	0	1	0

APPENDIX I. *Continued*

Subplot	A 1	A 2	A 3	A 4	A 5	B 1	B 2	B 3	B 4	B 5	C 1	C 2	C 3	C 4	C 5	D 1	D 2	D 3	D 4	D 5
05 C1 03	1	17	2	0	1	0	32	2	1	0	1	17	1	0	0	5	14	0	0	1
05 C1 04	2	21	1	0	1	2	25	2	1	1	2	22	1	0	0	0	14	2	1	0
05 C1 05	1	17	0	0	0	1	17	1	0	0	0	13	0	0	0	0	3	2	1	0
05 C1 06	2	10	1	0	0	2	16	2	0	0	0	16	0	1	0	0	2	0	0	0
05 C1 07	0	9	0	0	0	1	9	0	0	0	3	6	0	0	0	0	3	0	0	0
05 C1 08	0	9	0	0	0	1	13	0	0	0	2	10	0	0	0	2	12	0	0	0
05 C1 09	0	10	0	0	0	2	6	0	0	0	0	3	0	0	0	0	1	0	0	0
05 C1 10	2	2	0	0	0	0	9	0	0	0	0	6	0	0	0	0	1	0	0	0
05 C1 11	1	2	1	0	0	2	5	0	0	0	4	13	0	0	0	0	4	0	0	0
05 C1 12	0	2	0	0	0	0	3	0	0	0	0	8	0	0	0	0	6	0	0	0
05 C1 13	1	3	0	0	0	0	7	0	0	0	0	11	0	0	0	0	4	0	0	0
05 C1 14	1	7	0	0	0	2	2	0	1	0	0	2	1	0	0	1	2	0	0	0
05 C1 15	0	2	0	0	0	0	1	0	1	0	0	1	0	0	0	1	1	1	0	0
05 C1 16	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	1	1	0	0	0
05 C1 17	0	0	0	1	0	0	0	0	0	0	1	2	0	0	0	0	1	0	0	0
05 C1 18	0	2	0	0	0	0	4	0	0	0	0	5	0	0	0	0	1	0	0	0
05 C1 19	0	0	0	0	0	0	13	0	0	0	0	1	0	0	0	0	0	0	0	0
05 C1 20	0	2	0	0	0	0	15	0	0	0	0	3	0	0	0	0	1	0	0	0
05 C1 21	0	0	0	0	0	0	15	0	0	0	0	4	1	0	0	0	0	0	0	0
05 C1 22	0	0	0	0	0	0	2	1	0	0	0	3	0	0	0	0	3	0	0	0
05 C1 23	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0
05 C1 24	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
05 C1 25	0	1	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0
05 C1 26	2	2	0	0	0	0	0	0	0	0	0	4	0	0	0	1	1	0	0	0
05 C1 27	0	2	0	0	0	0	0	0	0	0	0	2	0	0	0	0	3	0	0	0
05 C1 28	0	1	0	0	0	0	3	0	0	0	0	3	0	0	0	0	1	0	0	0
05 C1 29	0	0	0	0	0	0	4	0	0	0	0	3	0	0	0	0	2	0	0	0
05 C1 30	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	0
05 C1 31	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	3	0	0	0
05 C1 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
05 C1 33	0	7	0	0	0	0	0	0	0	0	0	1	0	0	0	0	5	0	0	0
05 C1 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0
05 C1 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
05 C1 36	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
05 C1 37	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
05 C1 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
05 C1 39	0	1	0	0	0	2	3	0	0	0	0	0	0	0	0	2	5	1	0	0
05 C1 40	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
05 C1 41	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
05 C1 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
05 C1 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 C1 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A 1	A 2	A 3	A 4	A 5	B 1	B 2	B 3	B 4	B 5	C 1	C 2	C 3	C 4	C 5	D 1	D 2	D 3	D 4	D 5
05 D4 01	5	6	0	0	0	1	12	0	0	0	2	14	0	0	0	2	15	1	0	0
05 D4 02	4	1	1	0	0	3	5	1	0	0	4	5	0	0	0	4	9	0	0	0
05 D4 03	1	4	0	0	1	0	1	0	0	0	9	11	0	0	0	2	7	0	0	0
05 D4 04	2	1	0	0	0	0	1	0	0	0	0	8	0	0	0	0	9	0	0	0
05 D4 05	4	0	0	0	0	0	2	0	0	0	2	2	0	0	0	4	4	0	0	0
05 D4 06	4	4	0	0	0	1	3	0	0	0	4	3	0	0	0	3	5	0	0	0
05 D4 07	2	10	1	0	0	2	9	0	0	0	6	4	0	0	0	1	10	0	1	0
05 D4 08	1	17	0	0	0	0	16	0	0	0	2	9	0	0	2	1	12	0	0	1
05 D4 09	0	16	0	0	0	0	9	0	0	0	1	7	0	0	0	1	18	0	0	0
05 D4 10	1	7	0	0	1	2	5	0	0	0	0	9	0	0	0	0	11	0	0	0
05 D4 11	0	8	0	0	0	0	3	0	0	0	1	5	0	0	0	0	1	1	0	0
05 D4 12	0	9	1	0	0	0	11	0	0	0	0	1	0	0	0	0	4	0	0	0
05 D4 13	0	2	0	1	1	0	4	0	0	0	0	1	0	0	0	0	0	0	0	1
05 D4 14	1	3	0	0	0	0	4	0	0	0	0	0	0	0	0	0	3	0	0	0
05 D4 15	0	3	0	0	1	0	4	0	0	0	0	7	0	0	0	0	0	1	1	0
05 D4 16	0	5	0	0	0	0	5	0	0	0	0	1	0	1	0	0	0	1	0	0
05 D4 17	0	4	0	0	0	0	1	0	0	0	0	2	1	0	0	0	1	1	0	0
05 D4 18	0	6	0	0	0	1	0	0	0	0	0	4	0	0	0	0	1	0	0	0
05 D4 19	4	3	0	0	0	0	1	0	0	0	0	3	0	0	0	0	6	0	0	0
05 D4 20	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0
05 D4 21	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	2	0	0	0
05 D4 22	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	3	0	0	0
05 D4 23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 D4 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 D4 25	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
05 D4 26	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 D4 27	0	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	2	0	0	0
05 D4 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
05 D4 29	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
05 D4 30	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
05 D4 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 D4 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 D4 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 D4 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 D4 35	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
05 D4 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 D4 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 D4 38	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
05 D4 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 D4 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 D4 41	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
05 D4 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
05 D4 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 D4 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
05 D4 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 D4 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 D4 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 D4 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E2 01	2	28	1	0	1	0	43	1	0	0	1	34	1	0	0	1	19	0	0	1
05 E2 02	3	19	0	0	0	0	21	1	0	1	0	23	1	0	1	0	36	0	0	0
05 E2 03	0	11	2	0	1	2	14	0	0	2	1	16	0	0	0	0	27	1	0	0
05 E2 04	0	17	1	0	0	0	7	1	1	2	0	11	1	0	0	0	6	2	0	0
05 E2 05	0	20	1	1	0	0	3	0	0	0	4	8	0	0	0	0	12	0	0	0
05 E2 06	4	17	0	0	0	0	4	1	0	0	0	10	0	0	0	1	8	0	0	0
05 E2 07	5	8	0	0	0	5	16	0	0	0	1	7	0	0	0	1	4	0	1	0
05 E2 08	2	8	0	0	0	1	10	0	0	0	2	6	0	0	0	0	3	0	0	0
05 E2 09	2	2	0	0	0	1	8	0	0	0	2	8	0	0	0	1	7	1	0	0
05 E2 10	0	15	0	0	0	3	17	0	0	0	0	10	0	0	0	1	6	0	0	0
05 E2 11	2	6	0	0	0	3	7	0	0	0	3	6	0	0	0	0	8	0	0	0
05 E2 12	0	5	0	0	0	0	7	0	0	0	1	1	0	0	0	0	1	0	0	0
05 E2 13	2	7	0	1	0	0	4	0	0	0	0	2	0	0	0	1	6	1	0	0
05 E2 14	0	4	3	0	0	0	3	0	0	0	0	3	0	0	0	0	4	0	0	0
05 E2 15	0	5	0	0	0	2	5	0	0	0	0	1	0	0	0	0	4	0	0	0
05 E2 16	3	2	0	0	0	1	1	0	0	0	0	3	0	0	0	0	2	0	0	0
05 E2 17	0	2	0	0	0	0	4	0	0	0	2	2	0	0	0	0	1	1	0	0
05 E2 18	0	2	0	0	0	0	3	0	0	0	0	1	0	0	0	0	4	0	0	0
05 E2 19	0	1	0	0	0	1	3	1	0	0	1	6	0	0	0	0	1	0	0	0
05 E2 20	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
05 E2 21	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E2 22	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
05 E2 23	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0
05 E2 24	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
05 E2 25	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
05 E2 26	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
05 E2 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
05 E2 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E2 29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
05 E2 30	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
05 E2 31	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E2 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E2 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E2 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E2 35	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E2 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
05 E2 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E2 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E2 39	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
05 E2 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E2 41	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E2 42	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E2 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E2 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E4 01	5	16	0	0	0	2	16	1	0	0	2	13	1	0	0	4	11	1	1	2
05 E4 02	3	18	0	0	1	0	13	0	2	0	1	10	1	1	1	5	14	0	0	1
05 E4 03	2	15	1	0	1	0	27	0	1	0	0	18	1	3	1	0	17	0	0	2
05 E4 04	0	12	1	0	1	0	15	1	1	0	0	15	0	0	1	0	19	0	1	0
05 E4 05	0	3	1	1	0	1	5	0	0	0	0	7	0	0	0	0	7	0	0	0
05 E4 06	0	8	0	1	0	0	5	0	0	0	2	3	0	0	0	0	3	1	0	0
05 E4 07	0	2	1	0	0	0	2	0	1	0	0	6	1	0	0	0	2	0	0	0
05 E4 08	0	4	0	0	0	0	6	0	0	0	1	4	1	1	0	0	1	1	0	0
05 E4 09	0	4	0	0	0	0	2	0	0	0	0	2	0	0	1	0	0	0	1	0
05 E4 10	2	1	1	0	0	0	8	0	0	0	0	0	1	1	0	0	1	0	0	0
05 E4 11	0	2	1	0	0	1	2	0	0	0	0	3	0	0	0	0	3	0	0	0
05 E4 12	0	1	0	0	0	1	4	0	0	0	0	2	0	0	0	0	3	0	0	0
05 E4 13	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E4 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E4 15	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E4 16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E4 17	0	2	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0
05 E4 18	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
05 E4 19	0	1	0	1	0	0	0	1	0	0	0	0	2	0	0	0	1	0	0	0
05 E4 20	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E4 21	0	2	0	0	1	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0
05 E4 22	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E4 23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E4 24	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0
05 E4 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E4 26	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E4 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E4 28	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E4 29	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0
05 E4 30	0	2	1	0	0	1	5	0	0	0	0	1	0	0	0	0	2	0	0	0
05 E4 31	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E4 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E4 33	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E4 34	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
05 E4 35	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	0	0	0
05 E4 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E4 37	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E4 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E4 39	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E4 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E4 41	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
05 E4 42	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E4 43	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 E4 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G1 01	0	25	1	0	0	0	22	2	0	0	0	34	0	0	1	1	19	0	0	0
05 G1 02	0	36	2	0	0	0	37	0	0	1	0	39	2	0	0	3	40	0	1	0
05 G1 03	0	18	1	0	1	2	14	3	0	0	2	14	4	0	0	0	30	2	1	0
05 G1 04	1	12	1	0	0	1	12	0	0	0	0	15	1	0	0	1	12	1	0	1
05 G1 05	0	8	0	0	0	5	6	0	0	0	0	9	1	0	0	2	8	2	0	0
05 G1 06	0	10	0	0	0	0	4	0	1	0	2	11	0	0	0	1	6	0	1	0
05 G1 07	0	6	0	0	0	0	5	0	1	0	1	5	1	1	0	1	4	0	0	0
05 G1 08	0	4	0	0	0	0	8	0	0	0	0	4	0	1	0	2	6	0	0	0
05 G1 09	0	10	0	0	0	0	4	0	0	0	1	6	0	1	0	0	2	0	0	1
05 G1 10	1	7	0	0	0	0	8	0	0	0	0	8	0	0	0	2	4	0	1	0
05 G1 11	2	6	0	0	0	1	10	0	0	0	2	11	0	0	0	2	7	0	0	0
05 G1 12	0	3	0	0	0	0	4	0	0	0	0	0	0	0	0	0	1	1	0	0
05 G1 13	0	2	0	0	0	0	1	0	0	0	0	7	0	0	0	0	8	1	0	0
05 G1 14	0	3	0	0	0	0	0	0	0	0	0	4	0	0	0	0	5	0	0	0
05 G1 15	0	3	0	0	0	0	0	0	0	0	0	2	0	0	0	0	6	0	0	0
05 G1 16	0	3	0	0	0	1	0	0	0	0	0	3	0	0	0	0	1	0	0	0
05 G1 17	0	2	0	0	0	0	3	0	0	0	0	2	2	0	0	0	3	0	0	0
05 G1 18	0	4	1	0	0	0	1	0	0	0	0	3	0	0	0	0	4	0	0	0
05 G1 19	0	2	0	0	0	0	1	0	0	0	0	1	0	0	0	1	2	0	0	0
05 G1 20	0	4	0	0	0	0	2	0	0	0	0	1	0	0	0	0	1	0	0	0
05 G1 21	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	4	0	0	0
05 G1 22	0	3	0	0	0	0	1	0	0	0	1	0	0	0	0	1	6	0	0	0
05 G1 23	0	1	0	0	0	0	0	0	0	0	1	5	0	0	0	0	1	0	0	0
05 G1 24	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
05 G1 25	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
05 G1 26	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G1 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G1 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G1 29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G1 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G1 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G1 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
05 G1 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G1 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G1 35	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
05 G1 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G1 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G1 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G1 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G1 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G1 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G1 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G1 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G1 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G1 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G1 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G1 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G3 01	0	11	1	0	1	2	13	1	0	0	2	3	0	0	0	0	4	1	1	1
05 G3 02	2	12	1	0	1	2	12	1	0	0	0	11	1	0	0	0	17	0	1	0
05 G3 03	2	20	1	0	0	3	19	0	0	0	0	10	1	1	1	1	8	1	1	1
05 G3 04	0	21	1	0	0	1	10	0	0	2	1	21	0	0	0	1	16	2	1	0
05 G3 05	1	9	1	0	0	0	7	1	1	0	0	12	2	0	0	0	9	0	0	0
05 G3 06	0	4	0	2	2	1	13	0	0	0	0	7	1	0	0	0	3	0	0	0
05 G3 07	2	3	0	0	0	0	5	0	0	0	0	6	0	0	0	1	2	0	0	0
05 G3 08	4	5	0	0	0	0	3	0	0	0	1	0	0	0	0	1	0	0	0	0
05 G3 09	3	2	0	0	0	1	3	0	0	0	0	3	0	0	0	0	5	0	0	0
05 G3 10	0	5	0	0	0	0	4	0	0	0	0	1	0	0	0	0	2	0	0	0
05 G3 11	0	1	0	0	0	1	0	0	0	0	0	2	1	0	0	0	1	0	0	0
05 G3 12	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0
05 G3 13	0	1	0	0	0	0	2	0	0	0	0	3	0	0	0	0	3	0	0	0
05 G3 14	0	0	0	0	0	0	3	0	0	0	0	2	0	0	0	0	0	0	0	0
05 G3 15	0	3	0	0	0	0	3	0	0	0	0	2	1	0	0	1	2	0	0	0
05 G3 16	0	2	0	0	0	0	4	0	1	0	0	0	0	0	0	0	1	0	0	0
05 G3 17	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
05 G3 18	0	1	0	0	0	0	3	0	0	0	0	2	0	0	0	0	0	0	0	0
05 G3 19	0	1	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0
05 G3 20	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G3 21	0	0	0	0	0	0	0	0	0	0	1	3	0	0	0	0	2	0	0	0
05 G3 22	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
05 G3 23	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G3 24	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
05 G3 25	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G3 26	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G3 27	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
05 G3 28	0	2	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
05 G3 29	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G3 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G3 31	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0
05 G3 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G3 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G3 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G3 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G3 36	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
05 G3 37	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G3 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G3 39	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G3 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G3 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G3 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G3 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G3 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G3 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G3 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G3 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G3 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05 G3 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D1 01	0	3	0	0	1	1	13	0	4	0	1	9	1	0	0	0	12	0	1	0
06 D1 02	0	5	1	0	0	0	7	0	1	0	15	0	1	1	0	0	13	3	0	0
06 D1 03	0	5	0	0	1	0	2	0	1	1	1	12	2	0	0	3	12	0	0	0
06 D1 04	0	4	1	0	0	0	5	1	0	0	0	2	0	0	0	0	13	0	0	0
06 D1 05	0	2	1	0	0	0	3	1	0	0	0	4	0	0	0	0	2	0	0	0
06 D1 06	0	2	1	0	0	0	2	2	0	0	0	1	0	0	0	0	2	0	0	1
06 D1 07	0	1	0	0	0	0	3	1	0	0	0	2	1	0	0	0	2	0	0	0
06 D1 08	0	2	0	0	0	0	4	0	0	0	1	4	0	0	0	0	5	0	0	0
06 D1 09	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0	0	6	0	0	0
06 D1 10	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	2	0	0	0
06 D1 11	0	3	0	0	0	0	4	0	0	0	0	1	0	0	0	0	3	0	0	0
06 D1 12	0	1	0	0	0	0	5	0	0	0	0	3	0	0	0	0	2	0	0	0
06 D1 13	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	3	1	0	0
06 D1 14	0	2	0	0	0	0	1	0	0	0	0	3	0	0	0	0	0	0	0	0
06 D1 15	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D1 16	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D1 17	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
06 D1 18	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D1 19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D1 20	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0

APPENDIX I. *Continued*

Subplot			A					B					C					D		
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
06 D1 21	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
06 D1 22	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D1 23	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
06 D1 24	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D1 25	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D1 26	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D1 27	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
06 D1 28	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D1 29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D1 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D1 31	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D1 32	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D1 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D1 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D1 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D1 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D1 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D1 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D1 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D1 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D1 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D3 01	0	5	1	1	1	3	17	1	1	0	2	22	0	0	0	0	31	0	0	0
06 D3 02	0	8	1	0	2	1	32	0	1	0	0	22	1	1	0	2	24	0	3	0
06 D3 03	0	7	0	2	0	0	27	0	0	0	0	18	1	0	0	1	31	1	0	0
06 D3 04	1	7	0	1	0	0	18	0	0	0	0	8	1	0	0	1	16	1	0	0
06 D3 05	0	15	1	1	0	0	15	1	0	0	0	13	1	0	0	2	14	1	0	0
06 D3 06	0	4	0	0	0	10	1	0	0	0	0	3	0	0	0	3	6	0	0	0
06 D3 07	0	3	1	0	0	1	6	0	0	0	0	4	0	0	0	3	8	0	0	0
06 D3 08	0	2	1	0	0	0	3	0	0	0	0	4	1	0	0	1	3	0	0	0
06 D3 09	0	3	0	0	0	0	1	0	0	0	0	7	0	0	0	0	4	0	0	0
06 D3 10	0	1	1	0	0	0	5	0	0	0	0	5	1	0	0	0	7	0	0	0
06 D3 11	0	1	0	0	0	0	10	0	0	0	0	7	0	0	0	0	0	0	0	0
06 D3 12	0	0	0	0	0	0	2	0	0	0	0	3	1	1	0	0	0	0	0	0
06 D3 13	0	2	0	0	0	0	8	0	0	0	0	2	0	0	0	0	7	0	0	0
06 D3 14	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	3	0	0	0
06 D3 15	0	3	0	0	0	0	1	0	0	0	0	3	0	0	0	0	1	0	0	0
06 D3 16	0	4	0	0	0	0	1	0	0	0	0	0	0	0	0	0	4	0	0	0
06 D3 17	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0
06 D3 18	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
06 D3 19	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
06 D3 20	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
06 D3 21	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	0

APPENDIX I. *Continued*

Subplot			A					B					C					D		
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
06 D3 22	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
06 D3 23	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D3 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D3 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
06 D3 26	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0
06 D3 27	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
06 D3 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
06 D3 29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D3 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
06 D3 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D3 32	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D3 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D3 34	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
06 D3 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D3 36	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D3 37	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
06 D3 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D3 39	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D3 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D3 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D3 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 D3 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 E2 01	0	10	0	1	1	0	20	0	1	1	0	6	1	2	1	0	9	0	0	1
06 E2 02	0	13	0	0	1	0	18	0	0	0	0	8	1	4	1	1	7	1	1	0
06 E2 03	0	9	0	1	0	0	14	0	1	0	0	10	0	2	1	0	8	1	0	0
06 E2 04	1	15	0	0	0	0	10	1	2	0	0	13	0	1	0	0	14	0	0	0
06 E2 05	1	11	0	0	0	1	12	1	1	0	0	4	0	0	0	2	12	0	0	0
06 E2 06	0	10	0	0	0	3	9	0	0	0	0	11	0	0	0	0	7	0	1	0
06 E2 07	7	10	0	0	0	0	3	1	0	0	0	5	0	0	0	0	9	0	0	0
06 E2 08	2	9	1	0	0	2	11	0	0	0	0	11	0	0	0	0	12	0	0	0
06 E2 09	0	3	0	0	0	1	9	0	0	0	0	4	0	0	0	0	12	0	0	0
06 E2 10	0	2	0	0	0	0	7	0	0	0	0	4	0	0	0	0	11	0	0	0
06 E2 11	0	5	0	0	0	0	6	0	0	0	0	1	0	0	0	0	8	0	0	0
06 E2 12	0	3	0	0	0	0	5	0	0	0	1	11	0	0	0	0	3	0	0	0
06 E2 13	0	4	0	0	0	3	4	0	0	0	0	3	0	0	0	0	3	0	0	0
06 E2 14	0	2	0	0	0	1	3	0	0	0	0	1	0	0	0	0	7	0	0	0
06 E2 15	1	1	0	0	0	0	3	0	0	0	0	3	0	0	0	0	0	0	0	0
06 E2 16	0	7	0	0	0	0	1	0	0	0	0	2	0	0	0	0	3	0	0	0
06 E2 17	0	3	0	0	0	0	1	0	0	0	0	1	0	0	0	0	4	0	0	0
06 E2 18	0	3	0	0	0	0	2	0	0	0	0	1	0	0	0	1	0	0	0	0
06 E2 19	0	2	0	0	0	0	2	0	0	0	0	2	0	0	0	0	4	0	0	0
06 E2 20	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	1	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
06 E2 21	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0
06 E2 22	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
06 E2 23	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	2	1	0	0	0
06 E2 24	0	0	0	0	0	0	2	0	0	0	0	3	0	0	0	0	5	0	0	0
06 E2 25	0	1	0	0	0	0	3	0	0	0	0	1	0	0	0	0	1	0	0	0
06 E2 26	0	6	0	0	0	0	4	0	0	0	0	1	0	0	0	0	0	0	0	0
06 E2 27	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	2	0	0	0
06 E2 28	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
06 E2 29	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
06 E2 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
06 E2 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
06 E2 32	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0
06 E2 33	0	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
06 E2 34	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
06 E2 35	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
06 E2 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 E2 37	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0
06 E2 38	0	2	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
06 E2 39	0	1	0	0	0	0	1	0	0	0	0	2	0	0	0	0	3	0	0	0
06 E2 40	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	1	0	0	0
06 E2 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 E2 42	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
06 E2 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F1 01	0	24	0	0	0	0	33	0	0	0	3	31	0	1	0	0	20	1	1	0
06 F1 02	0	28	4	6	0	2	34	0	0	1	0	35	0	0	1	0	28	0	1	2
06 F1 03	2	35	0	0	1	0	12	0	0	1	1	11	1	2	0	0	16	1	2	0
06 F1 04	0	20	1	1	0	0	16	2	0	0	2	13	0	0	0	0	17	0	0	0
06 F1 05	0	9	0	0	0	1	9	0	0	0	0	8	0	0	0	2	22	0	1	0
06 F1 06	1	8	0	0	0	2	8	0	0	0	0	11	0	0	0	0	8	0	0	0
06 F1 07	1	8	0	0	0	2	12	0	0	0	0	7	0	0	0	0	3	0	0	0
06 F1 08	0	9	0	0	0	0	1	0	0	0	0	2	1	0	0	0	4	0	0	0
06 F1 09	0	4	0	0	0	0	5	0	0	0	1	8	0	0	0	0	5	0	0	0
06 F1 10	1	1	0	0	0	0	3	0	0	0	0	5	0	0	0	0	3	0	0	0
06 F1 11	0	3	0	0	0	0	5	0	0	0	0	5	0	0	0	0	4	0	0	0
06 F1 12	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	3	0	0	0
06 F1 13	0	3	0	0	0	0	1	0	0	0	1	1	1	0	0	0	2	0	0	0
06 F1 14	0	1	0	0	0	0	4	0	0	0	0	2	0	0	0	0	1	0	0	0
06 F1 15	0	2	0	0	0	1	1	0	0	0	0	3	0	0	0	0	1	0	0	0
06 F1 16	0	1	1	0	0	0	2	0	0	0	0	3	0	0	0	0	4	0	0	0
06 F1 17	0	1	0	0	0	0	1	0	0	0	0	4	0	0	0	0	2	1	0	0
06 F1 18	0	2	0	0	0	1	2	0	0	0	0	2	0	0	0	0	3	0	0	0
06 F1 19	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	1	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
06 F1 20	0	3	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0
06 F1 21	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0
06 F1 22	0	3	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0
06 F1 23	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F1 24	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F1 25	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
06 F1 26	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F1 27	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F1 28	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	3	0	0	0
06 F1 29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F1 30	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
06 F1 31	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
06 F1 32	0	0	1	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0
06 F1 33	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F1 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F1 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F1 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F1 37	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F1 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F1 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F1 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F1 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F1 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F1 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F3 01	2	11	0	1	1	2	15	0	1	1	3	12	0	0	0	1	3	0	1	0
06 F3 02	2	18	2	2	0	0	32	0	0	0	0	24	0	0	0	0	11	0	0	0
06 F3 03	0	32	0	2	0	0	29	1	0	0	0	15	1	1	1	0	20	2	2	0
06 F3 04	0	33	0	0	0	3	23	1	0	1	0	12	1	1	0	0	24	0	2	0
06 F3 05	1	25	2	0	0	0	15	0	0	0	0	9	0	0	1	0	21	0	0	0
06 F3 06	2	9	2	0	0	2	10	1	2	0	0	14	0	1	0	1	9	0	0	0
06 F3 07	1	13	0	0	0	1	4	2	0	0	1	8	0	0	0	0	11	0	0	1
06 F3 08	0	3	0	0	0	2	0	0	1	0	0	2	0	0	0	0	10	0	0	0
06 F3 09	0	3	0	0	0	0	2	0	0	0	0	8	2	0	0	0	6	0	0	0
06 F3 10	0	1	0	0	0	0	1	0	0	0	1	2	0	0	0	0	2	0	0	0
06 F3 11	0	5	0	0	0	3	5	0	0	0	1	2	0	0	0	0	0	0	0	0
06 F3 12	0	0	0	0	0	2	2	0	0	0	0	5	0	0	0	0	2	0	0	0
06 F3 13	0	3	0	0	0	4	2	0	0	0	0	5	0	0	0	0	2	0	0	0
06 F3 14	4	2	0	0	0	1	2	0	0	0	1	0	0	0	0	0	0	0	0	0
06 F3 15	0	2	0	0	0	1	2	0	0	0	0	0	0	0	0	0	2	0	0	0
06 F3 16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F3 17	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0
06 F3 18	0	1	0	0	0	0	2	0	0	0	1	1	0	0	0	0	4	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
06 F3 19	0	0	0	0	1	0	4	0	0	0	0	1	0	0	0	0	3	0	0	0
06 F3 20	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
06 F3 21	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	2	0	0	0
06 F3 22	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0
06 F3 23	3	2	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0
06 F3 24	0	2	0	0	0	0	0	0	0	0	1	1	0	0	0	0	3	0	0	0
06 F3 25	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
06 F3 26	0	1	0	0	0	0	3	0	0	0	0	2	0	0	0	0	0	0	0	0
06 F3 27	0	0	0	0	0	0	0	0	0	0	1	5	0	0	0	0	1	0	0	0
06 F3 28	0	2	0	0	0	0	3	0	0	0	0	5	0	0	0	0	4	0	0	0
06 F3 29	0	5	0	0	0	0	1	0	0	0	0	2	0	0	0	0	6	0	0	0
06 F3 30	0	2	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0
06 F3 31	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
06 F3 32	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F3 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F3 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F3 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
06 F3 36	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
06 F3 37	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F3 38	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0
06 F3 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F3 40	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F3 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F3 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F3 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F3 44	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F3 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F4 01	0	3	0	1	3	2	14	3	1	0	4	18	0	0	0	0	12	1	0	0
06 F4 02	2	10	0	0	3	0	20	0	0	0	1	20	1	0	0	0	13	0	1	0
06 F4 03	0	15	0	1	0	3	9	0	0	0	0	16	1	0	0	0	21	0	0	0
06 F4 04	0	9	0	2	0	0	32	1	1	0	1	26	1	0	0	0	24	0	0	0
06 F4 05	0	3	0	0	0	0	13	0	0	0	0	19	0	0	0	1	14	0	0	0
06 F4 06	0	5	0	0	0	0	5	0	0	0	0	14	0	0	0	0	8	0	0	0
06 F4 07	0	7	0	0	0	0	3	0	0	0	0	10	0	0	0	1	1	0	0	0
06 F4 08	0	4	0	0	0	0	1	0	0	0	0	9	0	0	0	0	9	0	0	0
06 F4 09	1	4	0	0	0	0	1	0	0	1	1	8	0	0	0	1	8	0	0	0
06 F4 10	0	3	0	0	0	0	4	0	0	0	0	2	0	0	0	0	5	0	0	0
06 F4 11	0	1	0	0	0	0	3	0	0	0	0	1	0	0	0	0	5	0	0	0
06 F4 12	0	3	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
06 F4 13	0	1	0	0	0	0	2	0	0	0	0	3	0	0	0	0	2	0	0	1
06 F4 14	0	2	0	0	0	0	1	1	0	0	0	5	0	0	0	0	3	0	0	1
06 F4 15	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	3	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
06 F4 16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
06 F4 17	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F4 18	0	0	0	0	0	0	4	0	0	0	0	4	0	0	0	0	1	0	0	0
06 F4 19	0	1	0	0	0	0	4	0	0	0	0	1	0	0	0	0	2	0	0	0
06 F4 20	0	7	0	0	0	0	4	0	0	0	0	1	0	0	0	0	4	0	0	0
06 F4 21	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0	0	1	0	0	0
06 F4 22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F4 23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F4 24	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	3	0	0	0
06 F4 25	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
06 F4 26	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0
06 F4 27	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0
06 F4 28	0	1	0	0	0	0	0	0	0	0	0	3	0	0	0	0	2	0	0	0
06 F4 29	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
06 F4 30	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	2	0	0	0
06 F4 31	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	3	0	0	0
06 F4 32	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F4 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F4 34	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
06 F4 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F4 36	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
06 F4 37	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F4 38	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F4 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F4 40	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
06 F4 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F4 42	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
06 F4 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 F4 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 G4 01	3	10	0	0	0	0	14	1	0	0	1	3	0	0	0	1	12	1	0	0
06 G4 02	0	25	0	0	1	0	26	1	0	0	0	13	1	0	1	0	3	2	0	0
06 G4 03	0	17	2	2	0	1	19	0	2	0	0	10	0	1	1	0	3	0	0	1
06 G4 04	0	15	0	2	2	0	18	0	0	0	0	9	0	0	1	1	15	0	2	1
06 G4 05	0	19	0	0	0	0	24	1	0	0	0	24	0	0	0	1	10	0	0	1
06 G4 06	1	29	0	0	0	0	20	0	0	0	2	21	1	0	0	1	16	0	0	0
06 G4 07	2	6	0	1	0	16	6	0	0	0	18	7	0	0	0	3	5	0	0	0
06 G4 08	3	7	0	0	1	11	10	1	0	0	1	11	0	0	0	0	2	0	0	0
06 G4 09	4	3	0	0	0	0	12	0	0	0	0	7	0	0	0	3	3	0	0	0
06 G4 10	5	2	0	0	0	3	4	0	0	0	0	1	0	0	0	0	3	0	0	0
06 G4 11	2	2	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0
06 G4 12	0	2	0	0	0	0	3	0	0	0	0	1	0	0	0	0	1	0	0	0
06 G4 13	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
06 G4 14	0	2	0	0	1	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0
06 G4 15	0	1	0	0	0	0	0	0	0	0	0	2	1	0	0	0	1	0	0	0
06 G4 16	0	3	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0
06 G4 17	0	4	0	0	0	0	2	0	0	0	0	0	0	0	0	0	3	0	0	0
06 G4 18	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0
06 G4 19	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0
06 G4 20	0	1	0	0	0	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0
06 G4 21	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
06 G4 22	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 G4 23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 G4 24	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
06 G4 25	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	2	0	0	0
06 G4 26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 G4 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 G4 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 G4 29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 G4 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 G4 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 G4 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 G4 33	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
06 G4 34	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
06 G4 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 G4 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 G4 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 G4 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 G4 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 G4 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 G4 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 G4 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 G4 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06 G4 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07 A1 01	0	39	3	0	0	0	17	0	0	0	0	17	1	0	0	0	37	1	1	0
07 A1 02	0	14	2	0	0	0	18	3	0	0	0	18	2	0	1	2	20	3	0	0
07 A1 03	0	9	1	0	0	0	12	0	0	0	0	16	2	0	0	0	18	1	0	0
07 A1 04	0	12	0	0	0	0	15	1	0	0	0	26	0	0	0	2	20	1	0	0
07 A1 05	0	3	0	0	0	0	2	0	0	0	0	12	0	0	0	0	13	0	0	0
07 A1 06	2	1	0	0	0	2	2	0	0	0	0	3	0	0	0	0	5	0	0	0
07 A1 07	0	2	0	0	0	0	3	0	0	0	0	2	0	0	0	0	8	0	0	0
07 A1 08	0	2	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0
07 A1 09	0	3	0	0	0	0	4	0	0	0	0	1	0	0	0	0	3	0	0	0
07 A1 10	0	6	0	0	0	0	2	0	0	0	0	2	0	0	0	0	4	0	0	0
07 A1 11	0	6	0	0	0	0	2	0	0	0	0	5	0	0	0	0	7	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
07 A1 12	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	6	0	0	0
07 A1 13	0	2	0	0	0	0	4	0	0	0	0	4	0	0	0	0	6	0	0	0
07 A1 14	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
07 A1 15	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	0	0	0
07 A1 16	0	2	0	0	0	0	3	0	0	0	0	2	0	0	0	0	2	0	0	0
07 A1 17	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0
07 A1 18	0	2	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
07 A1 19	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0
07 A1 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07 C2 01	0	5	1	0	0	0	11	0	0	0	0	26	0	0	0	5	14	1	0	1
07 C2 02	0	8	0	0	0	0	15	0	1	0	10	21	0	0	0	10	14	0	0	0
07 C2 03	0	15	0	1	0	10	24	2	0	0	10	12	0	0	0	8	15	0	0	0
07 C2 04	3	17	0	0	0	2	8	0	0	1	10	27	0	0	0	8	12	0	0	0
07 C2 05	5	12	0	0	0	3	14	2	1	0	0	17	1	0	0	0	13	0	1	0
07 C2 06	0	16	0	0	0	0	8	0	0	1	0	9	0	0	2	0	14	1	1	0
07 C2 07	0	6	0	0	0	0	7	0	0	0	0	8	0	0	1	0	11	0	0	0
07 C2 08	0	12	1	0	0	4	19	0	0	0	0	18	0	0	0	0	14	1	0	0
07 C2 09	0	11	0	0	0	0	2	0	0	0	0	4	0	0	0	0	3	0	0	0
07 C2 10	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	3	0	0	0
07 C2 11	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
07 C2 12	0	0	0	[illegible]	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
07 C2 13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07 C2 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07 C2 15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07 C2 16	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07 C2 17	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07 C2 18	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
07 E1 01	0	11	0	0	0	0	23	1	0	0	0	25	0	0	0	0	10	1	0	0
07 E1 02	0	11	2	1	0	0	21	3	0	0	0	30	0	0	0	0	14	1	0	0
07 E1 03	0	1	0	0	0	0	1	0	0	0	0	10	0	0	0	0	20	2	0	0
07 E1 04	0	2	1	0	0	0	4	0	0	0	0	9	1	1	0	0	6	2	0	1
07 E1 05	2	0	0	0	0	0	2	0	0	0	0	5	0	0	0	0	3	0	0	1
07 E1 06	0	1	0	0	0	0	3	0	0	0	0	2	0	0	0	0	5	0	0	0
07 E1 07	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
07 E1 08	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
07 E1 09	0	4	0	0	0	1	3	0	0	0	0	3	0	0	0	0	0	0	0	0
07 E1 10	0	2	0	0	0	0	6	0	0	0	0	1	0	0	0	0	3	0	0	0
07 E1 11	0	1	0	0	0	0	2	0	0	0	0	1	0	0	0	0	1	0	0	0
07 E1 12	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0
07 E1 13	0	0	0	0	0	0	2	0	0	0	0	4	0	0	0	0	3	0	0	0
07 E1 14	0	0	0	0	0	0	3	0	0	0	0	6	0	0	0	0	5	0	0	0
07 E1 15	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	3	1	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
07 E1 16	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	4	0	0	0
07 E1 17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07 E1 18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07 E1 19	0	2	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
07 E1 20	0	1	0	0	0	0	3	0	0	0	0	2	0	0	0	0	3	0	0	0
07 E1 21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
07 E3 01	0	15	1	0	0	0	14	0	1	0	0	16	0	1	0	0	25	1	0	0
07 E3 02	0	20	1	0	0	0	16	0	1	0	4	14	0	0	0	0	10	0	0	0
07 E3 03	0	15	0	0	0	0	18	0	0	0	0	16	1	0	0	0	5	0	0	0
07 E3 04	0	20	1	0	0	0	17	0	0	0	5	7	1	0	0	2	8	0	0	0
07 E3 05	0	1	0	0	0	0	2	0	0	0	0	1	0	0	0	0	3	0	0	0
07 E3 06	0	1	0	0	0	0	2	0	0	0	0	2	0	0	0	0	2	0	0	0
07 E3 07	0	0	0	0	0	0	6	0	0	0	0	1	0	0	0	0	2	0	0	0
07 E3 08	0	1	0	0	0	0	6	0	0	0	0	1	0	0	0	0	0	0	0	0
07 E3 09	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0
07 E3 10	0	1	0	0	0	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0
07 E3 11	0	0	0	0	0	0	1	0	0	0	0	3	0	0	0	0	3	0	0	0
07 E3 12	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	2	0	0	0
07 E3 13	0	0	0	0	0	0	1	0	0	0	0	3	0	0	0	0	3	0	0	0
07 E3 14	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
07 E3 15	0	0	0	0	0	0	3	0	0	0	0	3	0	0	0	0	0	0	0	0
07 E3 16	0	0	0	0	0	0	2	0	0	0	0	4	0	0	0	0	0	0	0	0
07 E3 17	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	3	0	0	0
07 E3 18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0
07 E3 19	0	3	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
07 E3 20	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07 E3 21	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
07 E3 22	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07 E3 23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07 E3 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07 E3 25	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
07 E3 26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07 G2 01	0	10	0	0	0	0	24	1	0	0	0	28	0	0	0	2	30	0	0	0
07 G2 02	0	11	0	0	2	0	39	0	1	0	0	25	0	0	0	0	25	0	0	0
07 G2 03	2	14	1	0	1	0	17	0	0	0	0	13	0	0	0	0	14	0	0	0
07 G2 04	0	4	0	0	0	0	3	0	0	0	0	6	0	0	0	0	15	0	1	0
07 G2 05	0	4	0	0	0	0	3	0	0	1	0	5	0	0	0	0	5	0	0	0
07 G2 06	0	3	0	0	0	0	1	0	0	0	0	3	0	0	0	0	3	0	0	0
07 G2 07	0	3	0	0	0	0	1	0	0	0	0	1	0	0	0	0	4	0	0	0
07 G2 08	0	4	0	0	0	0	4	0	0	0	0	2	0	0	0	0	3	0	0	0
07 G2 09	0	5	0	0	0	0	3	0	0	0	0	1	0	0	0	0	2	0	0	0
07 G2 10	0	3	0	0	0	0	8	0	0	0	0	3	0	0	0	0	6	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
07 G2 11	0	0	0	0	0	0	4	0	0	0	0	3	0	0	0	0	1	0	0	0
07 G2 12	0	3	0	0	0	0	2	0	0	0	0	2	0	0	0	0	2	0	0	0
07 G2 13	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
07 G2 14	0	2	0	0	0	0	1	0	0	0	0	2	0	0	0	0	1	0	0	0
07 G2 15	0	2	0	0	0	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0
07 G2 16	0	2	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0
07 H3 01	0	15	0	0	0	0	30	0	0	0	0	43	0	0	0	0	14	1	0	0
07 H3 02	0	35	1	0	0	0	42	0	0	0	0	25	1	1	0	0	15	1	0	0
07 H3 03	0	20	1	0	0	1	29	1	0	0	0	29	1	0	0	0	15	2	0	0
07 H3 04	0	18	0	0	0	0	20	1	1	0	0	22	1	0	0	0	20	2	0	0
07 H3 05	0	12	0	0	0	0	20	4	0	0	0	25	1	0	0	0	23	0	0	0
07 H3 06	0	21	1	0	0	0	38	0	0	0	0	40	1	0	0	0	29	1	0	0
07 H3 07	0	7	1	0	0	2	18	0	0	0	0	15	1	0	0	0	20	0	0	0
07 H3 08	0	19	0	0	0	0	11	0	0	0	0	22	0	0	0	0	16	0	0	0
07 H3 09	0	14	0	0	0	0	12	0	0	0	0	11	0	0	0	0	16	1	0	0
07 H3 10	0	12	1	0	0	1	2	0	0	0	0	9	0	0	0	0	11	0	0	0
07 H3 11	0	5	1	0	0	0	2	0	0	0	0	3	0	0	0	0	5	0	0	0
07 H3 12	0	4	0	0	0	0	6	0	0	0	0	5	0	0	0	0	9	0	0	0
07 H3 13	0	4	0	0	0	0	4	0	0	0	0	5	0	0	0	1	3	0	0	0
07 H3 14	1	2	0	0	0	0	3	0	0	0	0	3	0	0	0	0	2	0	0	0
07 H3 15	0	1	0	0	0	0	3	0	0	0	0	3	0	0	0	0	4	0	0	0
07 H3 16	0	3	0	0	0	0	5	0	0	0	0	4	0	0	0	0	7	0	0	0
07 H3 17	0	1	0	0	0	0	5	0	0	0	0	1	0	0	0	0	1	0	0	0
07 J3 01	0	12	2	0	0	0	11	1	0	0	0	15	3	0	0	0	17	2	0	0
07 J3 02	0	17	1	0	0	0	30	4	0	1	0	25	1	0	0	0	17	0	0	1
07 J3 03	0	20	0	0	0	0	20	0	0	1	0	12	0	0	0	0	13	0	0	0
07 J3 04	0	12	2	1	0	0	8	2	1	0	0	22	4	0	0	0	11	4	0	0
07 J3 05	0	17	0	0	0	0	10	0	0	0	0	24	0	0	0	0	27	0	1	0
07 J3 06	0	13	2	0	0	0	5	2	0	0	0	22	0	0	0	0	16	0	0	0
07 J3 07	0	5	0	0	0	0	4	0	0	0	0	7	2	0	0	0	3	0	0	0
07 J3 08	0	4	0	0	0	0	1	0	0	0	0	8	0	0	0	0	4	0	0	0
07 J3 09	0	6	0	0	0	0	6	0	0	0	0	4	1	0	0	0	7	0	0	0
07 J3 10	0	10	0	0	0	0	3	0	0	0	0	1	0	0	0	0	4	0	0	0
07 J3 11	0	7	0	0	0	0	10	1	0	0	4	6	0	0	0	5	4	0	0	0
07 J3 12	0	5	0	0	0	0	5	0	0	0	2	4	0	0	0	0	8	0	0	0
07 J3 13	0	5	0	0	0	0	5	0	0	0	0	4	0	0	0	0	13	0	0	0
07 J3 14	1	4	0	0	0	0	7	0	0	0	0	6	0	0	0	0	4	0	0	0
07 J3 15	1	2	0	0	0	0	3	0	0	0	5	5	0	0	0	3	6	0	0	0
07 J3 16	0	6	0	0	0	1	2	0	0	0	0	8	0	0	0	0	4	0	0	0
07 J3 17	0	5	0	0	0	0	3	0	0	0	0	1	0	0	0	0	3	0	0	0
07 J3 18	0	2	0	0	0	1	1	0	0	0	0	1	0	0	0	0	1	0	0	0
08 E2 01	1	36	0	0	0	0	48	0	0	0	0	29	1	0	0	0	24	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
08 E2 02	0	22	0	1	0	0	43	0	0	0	0	35	0	0	0	1	29	1	0	0
08 E2 03	1	24	0	2	0	0	42	1	2	0	0	21	0	0	0	0	20	0	0	0
08 E2 04	0	9	0	0	0	0	9	1	0	0	0	8	0	0	0	0	11	1	0	0
08 E2 05	0	0	3	1	0	0	7	0	0	1	0	5	0	0	0	0	8	0	1	1
08 E2 06	0	3	0	0	0	0	3	0	1	0	0	5	0	0	0	0	3	0	0	0
08 E2 07	0	1	0	0	0	0	2	0	0	0	0	4	0	0	0	0	3	0	0	0
08 E2 08	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0
08 E2 09	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0
08 E2 10	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0
08 E2 11	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 E2 12	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 E2 13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 E2 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 E2 15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 E2 16	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
08 E2 17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 E3 01	0	7	0	0	0	0	12	0	0	0	0	4	0	0	0	0	3	0	0	0
08 E3 02	0	12	0	0	0	0	10	1	0	0	0	3	1	0	0	0	9	0	0	0
08 E3 03	1	15	0	0	0	0	13	0	0	0	0	16	0	0	0	0	14	0	0	0
08 E3 04	0	11	0	0	0	0	22	0	1	0	0	28	2	0	0	0	20	0	0	0
08 E3 05	0	25	1	0	0	0	32	1	0	0	0	25	0	0	0	0	30	0	0	0
08 E3 06	3	30	1	0	0	0	30	0	0	0	4	28	0	0	0	2	24	0	0	0
08 E3 07	0	26	0	0	0	0	27	0	1	0	0	17	1	0	0	4	45	0	0	0
08 E3 08	0	9	1	0	0	0	38	1	0	0	4	34	1	0	0	0	34	2	0	0
08 E3 09	0	14	0	0	0	0	27	0	0	0	5	30	2	0	0	0	46	0	0	0
08 E3 10	0	19	1	0	0	0	16	0	0	0	0	7	0	0	0	4	20	4	0	0
08 E3 11	0	8	0	0	0	0	11	0	0	0	6	4	0	0	0	0	11	1	0	0
08 E3 12	0	9	0	0	0	0	6	0	0	0	0	9	0	0	0	6	5	0	0	0
08 E3 13	0	8	0	0	0	0	8	0	0	0	0	10	0	0	0	0	9	0	0	0
08 E3 14	0	9	0	0	0	4	14	0	0	0	0	8	0	0	0	3	6	0	0	0
08 E3 15	4	8	0	0	0	1	10	0	0	0	4	11	0	0	0	0	10	0	0	0
08 E3 16	4	14	0	0	0	1	7	0	0	0	0	13	0	0	0	1	13	0	0	0
08 E3 17	0	22	0	0	0	2	9	0	0	0	4	15	0	0	0	4	11	0	0	0
08 E3 18	2	15	0	0	0	5	18	0	1	0	2	16	0	0	0	0	9	0	0	0
08 E3 19	0	5	0	0	0	0	3	0	0	0	0	3	0	0	1	0	12	1	0	0
08 E3 20	0	2	0	0	0	0	1	0	0	0	0	1	0	0	0	0	8	0	0	0
08 E3 21	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	4	0	0	0
08 E3 22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 E3 23	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
08 E3 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 E3 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 E3 26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
08 E3 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 F3 01	0	39	1	0	0	0	32	0	0	0	0	38	0	0	0	0	38	0	0	0
08 F3 02	0	53	0	0	0	0	55	2	0	0	0	44	0	0	0	1	37	1	0	0
08 F3 03	0	45	0	0	0	0	30	2	0	0	0	55	0	0	0	0	44	0	0	0
08 F3 04	0	31	3	0	0	0	56	2	1	0	4	61	0	0	0	0	35	2	0	0
08 F3 05	0	32	0	0	0	0	40	0	0	0	0	34	1	2	0	0	22	3	1	0
08 F3 06	0	9	1	0	0	0	14	0	0	0	4	13	0	0	0	2	5	0	0	1
08 F3 07	3	14	0	0	0	1	6	0	0	0	1	5	0	0	0	1	4	1	0	0
08 F3 08	0	3	0	0	0	0	1	0	0	0	0	8	0	0	0	0	6	0	0	0
08 F3 09	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	0	0	0
08 F3 10	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 F3 11	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0	0	1	0	0	0
08 F3 12	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
08 F3 13	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0
08 F3 14	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
08 F3 15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 F3 16	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
08 F3 17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 F3 18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 F3 19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 F3 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 H1 01	0	50	1	0	0	0	50	2	0	0	0	55	3	0	0	0	55	1	0	0
08 H1 02	0	33	0	0	0	0	50	2	0	0	0	34	4	0	0	0	40	1	0	0
08 H1 03	2	40	1	1	0	4	60	0	0	0	0	47	0	0	0	0	40	1	1	0
08 H1 04	0	20	0	0	0	1	35	0	1	0	1	65	2	1	0	0	30	0	1	0
08 H1 05	0	24	0	0	0	0	25	0	2	0	0	22	1	0	0	0	12	0	0	0
08 H1 06	0	5	0	1	0	0	12	0	0	0	0	13	0	0	0	0	14	0	0	1
08 H1 07	0	12	0	0	0	0	5	0	0	0	0	0	1	0	0	0	1	0	0	0
08 H1 08	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
08 H1 09	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 H1 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 H1 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 H1 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 H1 13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 H1 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 H1 15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 H1 16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 H1 17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 H2 01	0	45	1	0	0	0	45	2	0	0	0	54	1	0	0	0	33	0	0	0
08 H2 02	0	46	0	0	0	0	51	0	0	0	0	65	1	0	0	0	50	0	0	0
08 H2 03	0	40	1	0	0	0	60	0	0	0	0	35	0	1	0	0	30	1	0	0
08 H2 04	0	35	0	0	0	0	40	0	0	0	0	40	1	0	0	0	30	0	0	0

APPENDIX I. *Continued*

Subplot			A					B					C					D		
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
08 H2 05	0	20	1	1	0	0	20	1	0	0	0	15	0	0	0	0	20	0	1	0
08 H2 06	0	5	0	0	0	0	15	2	0	0	0	10	0	1	0	0	20	0	0	0
08 H2 07	0	2	0	0	0	0	1	0	0	0	0	2	0	0	0	0	8	1	1	0
08 H2 08	0	0	0	0	0	0	1	0	1	0	0	0	2	0	0	0	4	0	0	0
08 H2 09	0	0	0	1	0	0	3	0	0	0	0	4	0	0	1	0	8	0	1	0
08 H2 10	0	1	1	0	0	0	2	0	0	0	0	9	0	0	0	0	8	0	0	0
08 H2 11	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	3	0	0	0
08 H2 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 H2 13	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
08 H2 14	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
08 H2 15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 H2 16	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 H2 17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 H2 18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 H4 01	5	75	1	0	0	3	65	2	0	0	4	41	2	0	0	0	52	1	0	0
08 H4 02	0	48	2	0	0	1	52	3	0	0	0	35	0	2	0	8	40	2	0	0
08 H4 03	1	50	2	0	0	1	70	5	0	0	0	74	1	0	0	0	90	1	0	0
08 H4 04	3	47	1	0	0	0	41	1	0	0	1	46	2	0	0	0	22	3	0	0
08 H4 05	0	15	2	0	2	0	29	2	2	0	0	20	0	0	0	1	9	4	0	1
08 H4 06	0	5	0	0	0	0	14	0	0	0	0	8	0	0	1	0	13	0	1	0
08 H4 07	0	3	0	0	0	0	1	0	0	0	0	2	0	0	0	0	1	0	0	0
08 H4 08	0	1	0	0	0	0	6	0	0	0	0	1	0	0	0	0	7	0	0	0
08 H4 09	0	3	0	0	0	0	8	0	0	0	0	8	1	0	0	0	7	0	0	0
08 H4 10	1	5	0	0	0	0	9	0	0	0	0	11	0	0	0	0	7	0	0	0
08 H4 11	0	6	0	0	0	0	10	0	0	0	0	8	0	0	0	0	6	0	0	0
08 H4 12	0	1	0	0	0	0	7	0	0	0	0	1	0	0	0	0	2	0	0	0
08 H4 13	0	6	0	0	0	0	5	0	0	0	0	1	0	0	0	0	2	0	0	0
08 H4 14	0	4	0	0	0	0	4	0	0	0	0	2	0	0	0	0	1	0	0	0
08 H4 15	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
08 H4 16	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
08 H4 17	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0
08 H4 18	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
08 H4 19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 H4 20	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
08 H4 21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08 J4 01	0	13	0	0	0	0	48	0	0	0	0	45	0	0	0	0	36	0	0	0
08 J4 02	0	54	0	0	0	0	42	1	0	0	0	49	2	0	0	0	28	1	0	0
08 J4 03	0	22	0	0	0	0	18	2	0	0	0	30	1	0	0	0	34	0	0	0
08 J4 04	0	30	1	0	0	0	16	1	0	0	1	20	2	1	0	0	25	4	0	0
08 J4 05	0	1	4	0	0	0	5	1	0	0	0	4	0	0	0	0	9	0	0	0
08 J4 06	0	2	0	0	0	0	5	0	0	0	0	2	2	0	0	0	5	1	0	0
08 J4 07	0	3	0	1	0	0	5	0	0	0	0	2	1	0	0	0	1	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
08 J4 08	0	6	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	1	0	0
08 J4 09	0	3	0	0	0	0	2	0	0	0	0	1	1	0	0	0	3	0	0	0
08 J4 10	0	1	0	0	0	0	2	0	0	0	0	3	1	0	0	0	1	0	0	0
08 J4 11	0	2	0	0	0	1	1	0	0	0	0	6	1	0	0	0	4	0	0	0
08 J4 12	0	0	0	0	0	0	0	0	0	0	0	4	1	0	0	0	0	0	0	0
08 J4 13	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0
08 J4 14	0	3	0	0	0	1	1	0	0	0	0	4	0	0	0	0	1	0	0	0
08 J4 15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
08 J4 16	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
08 J4 17	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
08 J4 18	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0
08 J4 19	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
09 B2 01	0	16	0	0	0	2	24	1	0	0	1	27	0	0	0	0	16	1	1	0
09 B2 02	2	25	0	1	0	2	17	2	0	0	1	12	0	1	0	2	12	2	1	0
09 B2 03	0	15	0	0	0	0	19	2	0	0	1	18	1	0	0	2	20	1	0	0
09 B2 04	0	8	0	1	0	0	6	2	0	1	3	16	0	0	0	1	18	0	1	0
09 B2 05	0	7	0	0	0	0	19	0	0	0	0	21	1	0	0	4	18	0	0	0
09 B2 06	5	11	0	0	0	1	18	0	0	0	2	15	0	0	0	2	26	0	0	0
09 B2 07	0	10	0	0	0	4	15	0	0	0	1	12	0	0	0	2	17	0	0	0
09 B2 08	1	7	0	0	0	2	13	0	0	0	0	13	0	1	0	1	6	0	0	0
09 B2 09	0	7	0	0	0	0	5	0	0	0	4	11	0	0	0	0	7	0	0	0
09 B2 10	0	3	0	0	0	0	4	0	0	0	1	7	0	0	0	0	4	1	0	0
09 B2 11	0	3	0	0	0	1	5	0	0	0	1	3	0	0	0	0	4	0	0	0
09 B2 12	0	3	0	0	0	0	5	0	0	0	1	3	0	0	0	2	2	0	0	0
09 B2 13	1	3	0	0	0	0	1	0	0	0	4	0	0	0	0	5	2	0	0	0
09 B2 14	3	0	0	0	0	0	3	0	0	0	2	3	0	0	0	3	3	0	0	0
09 B2 15	1	2	0	0	0	1	0	0	0	0	0	2	0	0	0	3	1	0	0	0
09 B2 16	1	0	0	0	0	0	2	0	0	0	2	1	0	0	0	0	1	0	0	0
09 B2 17	0	1	0	0	0	1	1	0	0	0	1	3	0	0	0	0	2	0	0	0
09 B2 18	2	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	5	0	0	0
09 B2 19	0	4	0	0	0	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0
09 B2 20	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
09 B2 21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 B2 22	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
09 B2 23	0	2	0	0	0	0	2	0	0	0	0	1	0	0	0	0	2	0	0	0
09 B2 24	0	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
09 B2 25	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0
09 B2 26	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
09 B2 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 B2 28	0	1	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
09 B2 29	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
09 B2 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A 1	A 2	A 3	A 4	A 5	B 1	B 2	B 3	B 4	B 5	C 1	C 2	C 3	C 4	C 5	D 1	D 2	D 3	D 4	D 5
09 B2 31	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
09 B2 32	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
09 B2 33	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0
09 B2 34	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
09 B2 35	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
09 B2 36	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
09 B2 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 B2 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 B2 39	0	4	0	0	0	0	1	0	0	0	0	0	0	0	0	0	3	0	0	0
09 B2 40	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
09 B2 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 B2 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 B2 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 B2 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 B2 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 B2 46	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
09 B2 47	0	2	0	0	0	0	4	0	0	1	0	2	0	0	0	0	0	0	0	0
09 B2 48	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
09 B2 49	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 B2 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 B2 51	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 B2 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
09 D3 01	0	21	0	0	0	1	9	0	1	1	0	28	2	0	0	0	18	0	0	0
09 D3 02	2	22	0	0	0	0	15	0	0	0	1	25	0	0	0	2	17	1	0	0
09 D3 03	0	18	0	0	1	2	9	1	1	0	0	27	1	0	0	6	19	0	0	0
09 D3 04	3	7	1	0	0	3	14	1	0	0	1	17	0	1	0	4	8	0	0	0
09 D3 05	6	18	0	0	0	3	16	1	0	0	2	16	0	0	0	1	21	0	0	0
09 D3 06	6	16	0	0	0	0	23	0	0	0	0	16	0	0	0	1	28	0	0	0
09 D3 07	2	20	0	0	0	2	21	0	0	0	0	16	0	0	0	3	20	0	0	0
09 D3 08	0	14	0	0	0	2	11	0	0	0	4	16	0	0	0	0	20	0	0	0
09 D3 09	4	19	0	0	0	2	8	0	0	0	8	22	0	0	0	2	23	0	0	0
09 D3 10	1	11	0	0	0	1	10	0	0	0	2	7	0	0	0	3	16	0	0	0
09 D3 11	1	15	0	0	0	1	14	0	0	0	2	2	0	0	0	4	13	0	0	0
09 D3 12	2	24	0	0	0	2	19	0	0	0	0	7	0	0	0	0	8	0	0	0
09 D3 13	2	11	0	0	0	0	18	0	0	0	0	11	0	0	0	3	2	0	0	0
09 D3 14	2	10	0	0	0	0	18	0	0	0	2	5	0	0	0	2	2	0	0	0
09 D3 15	2	9	0	0	0	1	14	0	0	0	2	8	0	0	0	4	0	0	0	0
09 D3 16	2	17	0	0	0	2	23	0	0	0	2	8	0	0	0	0	8	0	0	0
09 D3 17	0	6	0	0	0	1	9	0	0	0	1	5	0	0	0	0	2	0	0	0
09 D3 18	1	5	0	0	0	1	7	0	0	0	1	3	0	0	0	1	2	0	0	0
09 D3 19	0	6	0	0	0	0	9	0	0	0	0	5	0	0	0	0	0	0	0	0
09 D3 20	0	5	0	0	0	1	9	0	0	0	0	4	0	0	0	0	2	0	0	0

APPENDIX I. *Continued*

Subplot	A 1	A 2	A 3	A 4	A 5	B 1	B 2	B 3	B 4	B 5	C 1	C 2	C 3	C 4	C 5	D 1	D 2	D 3	D 4	D 5
09 D3 21	0	3	0	0	0	0	3	0	0	0	0	1	0	0	0	0	1	0	0	0
09 D3 22	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 D3 23	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
09 D3 24	0	1	0	0	0	1	2	0	0	0	0	1	0	0	0	0	1	0	0	0
09 D3 25	0	5	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
09 D3 26	0	3	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
09 D3 27	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 D3 28	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
09 D3 29	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
09 D3 30	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 D3 31	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
09 D3 32	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
09 D3 33	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
09 D3 34	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
09 D3 35	0	3	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
09 D3 36	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
09 D3 37	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 D3 38	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 D3 39	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 D3 40	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 D3 41	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 D3 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 D3 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 D3 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 D3 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 D3 46	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 D3 47	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 D3 48	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 D3 49	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 D3 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 D3 51	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
09 D3 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 E2 01	0	36	0	0	1	0	49	0	0	0	0	44	0	0	0	0	21	0	0	0
09 E2 02	0	16	0	1	0	0	13	0	0	0	2	19	3	0	1	1	17	1	0	0
09 E2 03	0	16	1	0	0	2	8	0	1	0	2	22	2	0	0	1	19	2	0	0
09 E2 04	2	31	1	0	0	2	30	0	0	0	4	19	0	0	0	3	18	2	0	0
09 E2 05	1	13	1	0	0	1	14	0	0	0	1	19	2	1	0	3	17	0	0	1
09 E2 06	2	18	0	0	0	4	11	1	0	1	3	14	0	2	0	5	13	0	0	0
09 E2 07	5	12	2	1	0	4	21	0	0	0	3	21	0	0	0	0	15	1	1	0
09 E2 08	4	15	0	0	0	1	16	0	0	0	7	19	0	0	0	4	15	0	0	0
09 E2 09	6	16	0	0	0	2	18	0	0	0	3	16	3	1	0	3	9	0	0	0
09 E2 10	3	5	0	0	1	2	13	0	0	0	4	14	0	0	0	1	9	0	0	0

APPENDIX I. *Continued*

Subplot			A					B					C					D		
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
09 E2 11	3	4	0	0	0	3	7	0	0	0	0	4	0	0	0	1	6	0	0	0
09 E2 12	4	4	0	0	0	3	1	1	0	0	1	7	0	0	0	0	3	1	0	0
09 E2 13	1	0	0	0	0	2	0	0	0	0	0	3	0	0	0	0	2	0	0	0
09 E2 14	0	3	0	0	0	1	4	0	0	0	1	0	0	0	0	1	4	0	0	0
09 E2 15	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
09 E2 16	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
09 E2 17	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 E2 18	0	0	0	0	0	1	4	0	0	0	0	1	0	0	0	0	0	0	0	0
09 E2 19	0	0	0	0	0	2	2	0	0	0	1	1	0	0	0	0	0	0	0	0
09 E2 20	0	2	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
09 E2 21	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
09 E2 22	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0
09 E2 23	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
09 E2 24	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0
09 E2 25	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
09 E2.26	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
09 E2 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 E2 28	0	3	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0
09 E2 29	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0
09 E2 30	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
09 E2 31	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0
09 E2 32	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
09 E2 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 E2 34	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
09 E2 35	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 E2 36	0	1	0	0	0	0	2	0	0	0	0	3	0	0	0	0	2	0	0	0
09 E2 37	0	0	0	0	0	0	6	0	0	0	0	3	0	0	0	0	8	0	0	0
09 E2 38	0	1	0	0	0	0	5	0	0	0	0	6	0	0	0	0	9	0	1	0
09 E2 39	0	0	0	0	0	0	2	0	0	0	0	5	0	0	0	0	9	0	0	0
09 E2 40	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	3	0	2	0
09 E2 41	0	0	0	0	0	0	1	0	0	0	0	4	0	0	0	0	1	0	0	0
09 E2 42	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	2	0	0	0
09 E2 43	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3	0	0	0
09 E2 44	0	0	0	0	0	0	1	0	0	0	0	8	0	0	0	0	2	0	0	0
09 E2 45	0	0	0	0	0	0	1	0	0	0	0	5	0	0	0	0	1	0	0	0
09 E2 46	0	0	0	0	0	0	1	0	0	0	0	4	0	0	0	0	1	0	0	0
09 E2 47	0	0	0	0	0	0	3	0	0	0	0	6	0	0	0	0	0	0	0	0
09 E2 48	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0
09 E2 49	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0
09 E2 50	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0
09 E2 51	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
09 E2 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
09 F1 01	0	18	0	0	0	0	23	0	0	0	1	23	1	0	0	0	13	1	0	0
09 F1 02	2	23	0	0	0	2	28	0	0	0	1	32	0	0	0	0	21	0	0	0
09 F1 03	0	14	0	0	0	3	15	0	0	0	0	14	0	0	0	3	12	1	0	0
09 F1 04	1	19	0	0	0	2	13	0	0	0	1	11	1	0	0	0	14	1	0	0
09 F1 05	1	17	1	0	0	1	13	1	0	0	2	14	2	0	0	2	15	1	0	0
09 F1 06	0	13	0	0	0	1	8	0	2	1	1	10	4	2	0	3	16	1	0	0
09 F1 07	1	4	0	0	0	0	3	0	1	0	3	4	2	0	0	0	7	0	0	0
09 F1 08	1	4	0	0	0	2	4	0	0	0	5	7	0	0	0	0	4	0	0	0
09 F1 09	0	6	0	0	0	0	4	0	0	0	0	1	0	0	0	2	4	0	0	0
09 F1 10	0	0	1	0	0	0	4	0	0	0	0	2	0	0	0	0	1	0	0	0
09 F1 11	0	9	0	0	0	0	2	0	0	0	0	3	0	0	0	0	0	0	0	0
09 F1 12	0	3	0	0	0	1	5	0	0	0	1	4	0	0	0	1	3	0	0	0
09 F1 13	0	3	0	0	0	1	2	0	0	0	0	5	0	0	0	0	3	0	0	0
09 F1 14	1	2	0	0	0	1	1	0	0	0	0	2	0	0	0	1	3	0	0	0
09 F1 15	0	5	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0
09 F1 16	0	6	0	0	0	0	3	0	0	0	0	2	1	0	0	0	2	0	0	0
09 F1 17	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
09 F1 18	0	1	0	0	0	1	3	0	0	0	0	1	0	0	0	3	3	0	0	0
09 F1 19	2	1	0	0	0	0	5	0	0	0	1	1	0	0	0	0	1	0	0	0
09 F1 20	0	1	0	0	0	0	2	0	0	0	0	1	0	0	0	0	1	0	0	0
09 F1 21	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F1 22	1	3	0	0	0	0	4	0	0	0	0	2	0	0	0	0	1	0	0	0
09 F1 23	0	4	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F1 24	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0
09 F1 25	0	5	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0
09 F1 26	0	1	0	0	0	0	2	0	0	0	0	1	0	0	0	0	1	0	0	0
09 F1 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F1 28	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F1 29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
09 F1 30	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
09 F1 31	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0
09 F1 32	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	1	0	0	0
09 F1 33	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
09 F1 34	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F1 35	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	4	0	0	0
09 F1 36	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	2	0	0	0
09 F1 37	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	3	0	0	0
09 F1 38	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
09 F1 39	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0
09 F1 40	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	0	0	0
09 F1 41	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	4	0	0	0
09 F1 42	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
09 F1 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F1 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F1 45	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F1 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F1 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F1 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F1 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F1 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F1 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F1 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F4 01	0	15	1	0	0	1	16	1	1	0	0	28	2	0	0	0	20	1	0	0
09 F4 02	3	23	2	0	0	0	21	2	0	0	0	20	0	1	0	0	8	1	0	0
09 F4 03	1	19	2	0	0	0	18	2	0	1	1	19	0	0	0	3	17	0	0	0
09 F4 04	2	10	1	0	0	0	18	1	0	0	4	15	1	0	0	3	20	1	0	0
09 F4 05	0	17	2	0	0	2	16	0	0	0	1	12	1	0	0	1	9	0	0	0
09 F4 06	2	8	0	0	0	4	12	0	0	0	0	9	0	0	0	1	8	0	0	0
09 F4 07	0	12	1	0	0	0	19	0	0	0	0	13	0	0	0	0	8	0	0	0
09 F4 08	2	3	0	0	0	0	11	0	0	0	0	5	0	0	0	0	6	1	0	0
09 F4 09	0	1	0	0	0	0	4	0	0	0	0	3	0	0	0	0	2	0	0	0
09 F4 10	0	1	0	0	0	0	5	0	0	0	1	3	0	0	0	0	1	0	0	0
09 F4 11	0	0	0	0	0	0	1	0	0	0	0	4	0	0	0	3	4	0	0	0
09 F4 12	0	4	0	0	0	3	0	0	0	0	0	3	0	0	0	0	1	0	0	0
09 F4 13	2	6	0	0	0	2	1	0	0	0	0	0	0	0	0	0	1	0	0	0
09 F4 14	0	1	0	0	0	0	1	0	0	0	2	2	0	0	0	0	2	0	0	0
09 F4 15	0	0	0	0	0	0	2	0	0	0	0	5	0	0	0	0	0	0	0	0
09 F4 16	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F4 17	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
09 F4 18	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F4 19	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F4 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
09 F4 21	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	1	0	0	0
09 F4 22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F4 23	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
09 F4 24	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F4 25	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
09 F4 26	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
09 F4 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
09 F4 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
09 F4 29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0
09 F4 30	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
09 F4 31	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	3	0	0	0
09 F4 32	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
09 F4 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F4 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F4 35	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0
09 F4 36	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0
09 F4 37	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	1	0	0	0
09 F4 38	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0
09 F4 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F4 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F4 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F4 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F4 43	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F4 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F4 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F4 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F4 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F4 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F4 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F4 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F4 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 F4 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 G1 01	4	11	0	0	0	0	3	0	0	0	0	5	0	0	0	1	16	0	0	0
09 G1 02	2	26	0	0	0	0	17	0	0	0	0	9	0	0	0	2	23	0	0	0
09 G1 03	2	20	0	0	0	4	27	0	0	0	2	16	1	0	0	5	15	1	1	0
09 G1 04	5	15	0	0	0	2	14	1	0	0	2	19	1	0	0	4	15	1	2	0
09 G1 05	18	19	0	0	0	9	15	0	0	0	10	16	0	0	0	4	7	1	1	0
09 G1 06	10	15	0	0	0	8	11	0	1	0	6	21	0	0	0	7	3	0	0	0
09 G1 07	4	16	0	0	0	2	11	0	1	0	5	2	0	0	1	6	8	0	0	0
09 G1 08	2	9	0	0	0	4	6	0	0	0	2	6	0	0	0	5	8	0	0	0
09 G1 09	0	13	0	0	0	1	5	0	0	0	1	10	0	0	0	1	9	0	0	0
09 G1 10	0	4	0	0	0	1	14	0	0	0	4	7	0	0	0	2	6	0	0	0
09 G1 11	0	0	1	0	0	0	5	1	0	0	1	5	0	0	0	0	3	0	0	0
09 G1 12	0	0	1	0	0	0	2	0	0	0	0	5	0	0	0	1	3	0	0	0
09 G1 13	0	6	0	0	0	0	1	0	0	0	0	3	0	0	0	0	1	0	0	0
09 G1 14	0	3	0	0	0	0	1	0	0	0	0	4	0	0	0	0	0	0	0	0
09 G1 15	0	3	0	0	0	0	2	1	0	0	0	2	0	0	0	0	2	0	0	0
09 G1 16	0	1	0	0	0	0	1	0	0	0	0	4	1	0	0	0	0	0	0	0
09 G1 17	0	0	0	0	0	0	1	0	0	0	0	5	0	0	0	0	0	0	0	0
09 G1 18	0	0	0	0	0	0	0	1	0	0	0	4	0	0	0	0	1	0	0	0
09 G1 19	0	0	0	0	0	0	1	1	0	0	0	7	0	0	0	0	3	0	0	0
09 G1 20	0	5	0	0	0	0	1	1	0	0	0	0	0	0	0	0	3	0	0	0
09 G1 21	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0
09 G1 22	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	4	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
09 G1 23	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	3	0	0	0
09 G1 24	0	2	0	0	0	0	6	0	0	0	0	2	0	0	0	0	3	0	0	0
09 G1 25	0	2	0	0	0	0	1	0	0	0	0	1	0	0	0	0	5	0	0	0
09 G1 26	0	0	0	0	0	0	3	0	0	0	0	2	0	0	0	0	4	0	0	0
09 G1 27	0	1	0	0	0	0	1	1	0	0	0	4	0	0	0	0	3	0	0	0
09 G1 28	0	2	0	0	0	0	6	0	0	0	0	1	0	0	0	0	1	0	0	0
09 G1 29	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	1	2	0	0	0
09 G1 30	0	0	0	0	0	2	3	0	0	0	0	1	0	0	0	0	4	0	0	0
09 G1 31	0	1	0	0	0	0	4	0	0	0	0	8	0	0	0	0	8	0	0	0
09 G1 32	0	1	0	0	0	0	1	0	0	0	0	4	0	0	0	0	4	0	0	0
09 G1 33	0	1	0	0	0	1	0	0	0	0	0	6	0	0	0	0	8	0	0	0
09 G1 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
09 G1 35	0	4	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
09 G1 36	0	2	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0
09 G1 37	0	5	0	0	0	0	1	0	0	0	1	2	0	0	0	1	5	0	0	0
09 G1 38	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
09 G1 39	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
09 G1 40	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
09 G1 41	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	5	0	0	0
09 G1 42	0	2	0	0	0	0	3	0	0	0	0	1	0	0	0	0	5	0	0	0
09 G1 43	0	1	0	1	0	0	1	0	1	0	0	2	0	0	0	0	0	0	0	0
09 G1 44	0	3	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0
09 G1 45	0	1	1	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0
09 G1 46	0	3	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
09 G1 47	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 G1 48	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 G1 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 G1 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 G1 51	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 G1 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 J1 01	0	29	0	0	0	1	35	2	0	0	0	42	1	0	0	0	38	1	0	0
09 J1 02	3	27	1	0	0	2	28	0	0	0	4	21	1	0	0	3	27	0	0	0
09 J1 03	8	20	0	0	0	5	16	0	1	0	3	29	1	0	0	0	19	0	0	0
09 J1 04	4	23	0	0	0	9	21	1	2	0	7	16	0	0	0	5	21	0	0	0
09 J1 05	3	24	0	0	0	7	18	0	0	0	11	27	0	0	0	1	18	0	0	1
09 J1 06	1	25	1	0	0	0	18	0	0	0	13	20	0	0	0	6	15	0	0	1
09 J1 07	1	19	0	1	0	1	21	0	0	0	4	18	0	0	0	2	16	0	0	0
09 J1 08	2	13	0	0	0	1	13	0	0	0	1	23	0	0	0	0	16	0	0	0
09 J1 09	1	8	0	0	0	1	8	0	0	0	0	10	0	0	0	2	23	0	0	0
09 J1 10	1	4	0	0	0	0	3	0	0	0	2	7	1	0	0	0	2	0	0	0
09 J1 11	1	1	0	0	0	2	3	0	0	0	0	3	0	0	0	0	2	0	0	0
09 J1 12	0	2	0	0	0	0	3	0	0	0	1	3	0	0	0	0	1	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
09 J1 13	1	5	0	0	0	0	6	0	0	0	0	0	0	0	0	0	2	0	0	0
09 J1 14	0	4	0	0	0	0	2	0	0	0	0	2	0	0	0	0	2	0	0	0
09 J1 15	0	6	0	0	0	0	4	0	0	0	0	3	0	0	0	0	0	0	0	0
09 J1 16	0	2	0	0	0	0	1	0	0	0	0	3	0	0	0	0	0	0	0	0
09 J1 17	0	0	0	0	0	0	3	0	0	0	0	3	0	0	0	0	0	0	0	0
09 J1 18	0	0	0	0	0	0	1	0	0	0	0	3	0	0	0	0	1	0	0	0
09 J1 19	0	0	0	0	0	0	0	1	0	0	0	4	0	0	0	0	1	0	0	0
09 J1 20	0	0	0	0	0	0	1	0	0	0	0	3	0	0	0	0	1	0	0	0
09 J1 21	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 J1 22	0	4	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0
09 J1 23	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 J1 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 J1 25	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 J1 26	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
09 J1 27	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 J1 28	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
09 J1 29	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
09 J1 30	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2	0	0	0
09 J1 31	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
09 J1 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 J1 33	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
09 J1 34	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0
09 J1 35	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
09 J1 36	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0	0	1	0	0	0
09 J1 37	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
09 J1 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
09 J1 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
09 J1 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 J1 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 J1 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 J1 43	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	4	0	0	0
09 J1 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
09 J1 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
09 J1 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 J1 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09 J1 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
09 J1 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
09 J1 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
09 J1 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
09 J1 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 B2 01	2	51	1	0	0	2	32	1	0	0	2	30	2	0	0	2	18	0	0	0
10 B2 02	2	25	1	0	0	2	31	2	0	0	7	28	6	0	0	3	15	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
10 B2 03	0	23	0	0	0	2	14	1	0	0	2	20	5	0	0	1	16	1	0	0
10 B2 04	1	19	1	0	0	5	15	0	0	0	2	17	1	0	0	1	15	2	1	0
10 B2 05	1	24	0	0	0	0	8	1	1	1	5	17	0	0	0	1	19	0	0	0
10 B2 06	2	11	0	0	0	3	12	2	0	0	1	20	0	1	0	1	9	0	0	0
10 B2 07	2	14	0	0	0	7	10	0	0	0	9	19	0	0	0	0	15	0	0	0
10 B2 08	0	17	1	0	0	5	13	2	0	0	6	16	0	0	0	4	8	1	0	0
10 B2 09	1	14	0	0	0	4	9	0	0	0	8	13	0	0	0	0	9	0	0	0
10 B2 10	0	16	0	0	0	5	9	0	0	0	1	9	0	0	0	2	5	0	0	0
10 B2 11	0	12	0	0	0	0	15	0	0	0	3	19	0	0	0	1	4	0	0	0
10 B2 12	0	11	0	0	0	2	8	1	0	0	7	14	0	0	0	0	2	0	0	0
10 B2 13	0	4	0	0	0	3	8	0	0	0	3	8	0	0	0	0	3	0	0	0
10 B2 14	0	5	0	0	0	0	6	1	0	0	1	7	0	0	0	0	2	0	0	0
10 B2 15	0	4	0	0	0	0	4	0	0	0	0	5	0	0	0	0	3	0	0	0
10 B2 16	0	1	0	0	0	1	1	0	0	0	1	7	0	0	0	0	4	0	0	0
10 B2 17	0	3	0	0	0	1	1	0	0	0	1	5	0	0	0	0	3	0	0	0
10 B2 18	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0
10 B2 19	0	3	0	0	0	0	5	0	0	0	0	1	0	0	0	0	2	0	0	0
10 B2 20	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
10 B2 21	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
10 B2 22	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 B2 23	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
10 B2 24	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 B2 25	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 B2 26	0	6	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
10 B2 27	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
10 B2 28	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 B2 29	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
10 B2 30	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
10 B2 31	0	5	0	0	0	0	1	0	0	0	0	0	0	0	0	0	3	0	0	0
10 B2 32	0	2	0	0	0	0	5	0	0	0	0	0	0	0	0	0	3	0	0	0
10 B2 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
10 B2 34	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	3	0	0	0
10 B2 35	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0
10 B2 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0
10 B2 37	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
10 B2 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 B2 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 B2 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 B2 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 B2 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 B2 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 B2 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
10 B2 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 B2 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 B2 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 B2 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 B2 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 B2 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 B2 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 B2 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 C4 01	1	24	3	0	0	0	40	1	0	0	0	36	0	0	0	0	40	2	0	0
10 C4 02	1	22	0	0	1	2	37	1	0	1	2	28	1	0	0	4	27	1	0	0
10 C4 03	2	24	0	0	0	1	25	0	0	0	4	28	0	0	0	4	18	1	0	0
10 C4 04	0	13	1	0	1	0	25	0	0	0	2	16	0	0	0	2	13	2	0	0
10 C4 05	0	31	0	0	0	1	31	0	1	0	1	14	0	1	0	2	26	0	1	0
10 C4 06	1	10	1	1	0	5	24	0	0	0	0	20	0	0	0	1	23	0	0	0
10 C4 07	1	11	0	0	0	0	14	0	0	0	2	12	0	0	0	1	14	1	0	0
10 C4 08	0	2	1	0	0	1	6	1	0	0	1	9	0	0	0	0	14	0	0	0
10 C4 09	0	8	0	0	0	1	8	0	0	0	1	14	0	0	0	1	11	0	0	0
10 C4 10	0	8	0	1	0	0	8	0	0	0	1	4	0	0	0	2	5	0	0	0
10 C4 11	0	14	0	0	0	1	9	0	0	0	2	9	0	0	0	0	6	0	0	0
10 C4 12	4	6	0	0	0	3	4	0	0	0	1	3	0	0	0	1	1	0	0	0
10 C4 13	1	9	0	0	0	0	5	0	0	0	0	5	0	0	0	0	3	0	0	0
10 C4 14	4	9	0	0	0	1	8	0	0	0	1	9	0	0	0	0	1	0	0	0
10 C4 15	4	6	0	0	0	3	5	0	0	0	0	1	0	0	0	0	0	0	0	0
10 C4 16	2	7	0	0	0	2	8	0	0	0	2	2	0	0	0	0	0	0	0	0
10 C4 17	0	5	0	0	0	0	3	0	0	0	1	2	0	0	0	0	1	1	0	0
10 C4 18	2	6	0	0	0	3	3	0	0	0	1	9	0	0	0	0	3	0	0	0
10 C4 19	0	3	0	0	0	0	6	0	0	0	0	5	0	0	0	1	1	0	0	0
10 C4 20	0	6	0	0	0	0	6	0	0	0	0	2	0	0	0	0	0	0	0	0
10 C4 21	0	4	0	0	0	0	5	0	0	0	1	2	0	0	0	1	0	0	0	0
10 C4 22	0	4	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
10 C4 23	0	5	2	0	0	0	1	0	0	0	2	4	0	0	0	0	1	0	0	0
10 C4 24	0	3	0	0	0	1	1	0	0	0	0	1	0	0	0	0	1	0	0	0
10 C4 25	0	3	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
10 C4 26	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
10 C4 27	0	0	0	0	0	0	1	0	0	0	0	4	0	0	0	0	3	0	0	0
10 C4 28	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0
10 C4 29	0	1	0	0	0	0	0	0	0	0	0	3	0	0	0	0	4	0	0	0
10 C4 30	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
10 C4 31	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0
10 C4 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 C4 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 C4 34	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
10 C4 35	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0
10 C4 36	0	3	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
10 C4 37	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
10 C4 38	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
10 C4 39	0	5	0	0	0	0	3	0	0	0	0	1	0	0	0	0	2	0	0	0
10 C4 40	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 C4 41	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0
10 C4 42	0	2	0	0	0	0	2	0	0	0	0	2	0	0	0	0	1	0	0	0
10 C4 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
10 C4 44	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	0	0	0
10 C4 45	0	8	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
10 C4 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 C4 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 C4 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 C4 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 C4 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 C4 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 C4 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 D4 01	2	49	1	1	0	3	45	0	0	0	5	51	1	0	0	2	36	1	0	0
10 D4 02	4	29	1	0	0	2	20	2	1	0	2	21	0	0	0	2	27	0	0	0
10 D4 03	2	20	0	0	1	3	27	1	1	0	3	20	0	1	0	1	19	0	2	0
10 D4 04	1	16	0	1	0	0	28	1	0	0	3	7	1	0	0	4	28	1	0	0
10 D4 05	1	22	0	0	0	6	25	0	0	0	4	23	0	0	0	5	18	0	0	0
10 D4 06	3	8	0	0	0	1	6	0	1	0	5	18	0	0	0	4	23	0	0	0
10 D4 07	1	18	0	0	0	0	15	0	0	0	7	19	0	0	0	7	16	0	0	0
10 D4 08	2	23	0	0	0	3	21	0	0	0	7	22	0	0	0	9	18	0	0	0
10 D4 09	0	23	0	0	0	2	27	0	0	0	6	17	0	0	0	8	29	0	0	0
10 D4 10	1	34	0	0	0	1	9	0	0	0	6	12	0	0	0	2	12	0	0	0
10 D4 11	0	21	0	0	0	0	12	0	0	0	1	12	0	0	0	1	7	0	0	0
10 D4 12	1	12	0	0	0	1	9	0	0	0	3	2	0	0	0	1	15	0	0	0
10 D4 13	0	17	0	0	0	2	13	0	0	0	0	7	0	0	0	0	9	0	0	0
10 D4 14	1	15	0	0	0	2	12	0	0	0	1	5	0	0	0	1	6	1	1	0
10 D4 15	1	16	0	1	0	1	12	0	0	0	0	2	0	0	0	0	9	0	0	0
10 D4 16	1	11	0	0	0	0	9	0	0	0	1	6	0	0	0	0	8	0	0	0
10 D4 17	0	14	0	0	0	0	9	0	0	0	0	12	0	0	0	1	11	0	0	0
10 D4 18	0	11	0	0	0	0	8	0	0	0	0	0	0	0	0	0	4	0	0	0
10 D4 19	0	4	0	0	0	0	10	0	0	0	0	5	0	0	0	0	2	0	0	0
10 D4 20	0	9	1	0	0	0	11	0	0	0	0	5	0	0	0	0	4	0	0	0
10 D4 21	0	3	0	0	0	0	4	0	0	0	0	3	0	0	0	0	1	0	0	0
10 D4 22	0	1	0	0	0	0	4	0	0	0	0	6	0	0	0	0	1	0	0	0
10 D4 23	0	4	0	0	0	0	4	0	0	0	0	3	0	0	0	0	3	0	0	0
10 D4 24	0	1	0	0	0	0	5	0	0	0	0	4	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A 1	A 2	A 3	A 4	A 5	B 1	B 2	B 3	B 4	B 5	C 1	C 2	C 3	C 4	C 5	D 1	D 2	D 3	D 4	D 5
10 D4 25	0	2	0	0	0	0	1	0	0	0	0	3	0	0	0	0	0	0	0	0
10 D4 26	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	1	0	0	0
10 D4 27	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 D4 28	0	0	0	0	0	0	2	0	1	0	0	4	0	0	0	0	11	0	0	0
10 D4 29	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	7	0	0	0
10 D4 30	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	5	0	0	0
10 D4 31	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0
10 D4 32	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
10 D4 33	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
10 D4 34	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	4	0	0	0
10 D4 35	0	1	0	0	0	0	3	0	0	0	0	0	0	0	0	0	6	0	0	0
10 D4 36	0	7	0	0	0	0	1	0	0	0	0	0	0	0	0	0	8	0	0	0
10 D4 37	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 D4 38	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0
10 D4 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0
10 D4 40	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0
10 D4 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0
10 D4 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0
10 D4 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0
10 D4 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0
10 D4 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0
10 D4 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0
10 D4 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
10 D4 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
10 D4 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0
10 D4 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0
10 D4 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0
10 D4 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
10 E1 01	7	17	0	0	0	3	7	0	0	0	5	8	0	0	0	3	21	2	0	0
10 E1 02	1	37	0	0	0	0	27	1	0	0	1	27	2	0	0	3	12	1	0	0
10 E1 03	0	18	2	0	0	1	17	3	0	0	1	16	1	0	0	3	3	1	0	0
10 E1 04	0	10	2	0	0	0	7	0	0	0	3	12	1	1	0	1	10	1	1	0
10 E1 05	1	9	0	0	0	0	4	0	1	0	1	10	2	0	0	1	7	1	2	0
10 E1 06	0	10	1	0	0	0	6	1	0	0	0	7	0	2	1	0	5	1	1	0
10 E1 07	0	9	0	0	0	0	8	0	0	0	2	8	0	0	0	0	8	1	0	0
10 E1 08	0	5	0	0	0	1	7	0	0	0	1	1	0	0	0	0	4	0	0	0
10 E1 09	0	6	0	0	0	0	6	0	0	0	0	3	0	0	0	0	4	0	0	0
10 E1 10	0	5	0	0	0	0	5	0	0	0	0	1	0	0	0	0	2	1	0	0
10 E1 11	0	2	0	0	0	0	2	0	0	0	0	1	0	0	0	0	2	0	0	0
10 E1 12	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	3	0	0	0
10 E1 13	0	0	0	0	0	0	4	0	0	0	0	3	0	0	0	0	5	0	0	0
10 E1 14	0	1	0	0	0	0	5	0	0	0	0	1	1	0	0	0	1	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
10 E1 15	0	1	0	0	0	0	4	1	0	0	0	2	0	0	0	0	2	0	0	0
10 E1 16	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
10 E1 17	0	1	0	0	0	0	0	0	0	0	0	3	0	0	0	1	2	0	0	0
10 E1 18	0	2	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
10 E1 19	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 E1 20	0	1	0	0	0	0	3	0	0	0	0	2	0	0	0	0	3	0	0	0
10 E1 21	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	4	0	0	0
10 E1 22	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
10 E1 23	0	1	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
10 E1 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 E1 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
10 E1 26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 E1 27	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
10 E1 28	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 E1 29	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
10 E1 30	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
10 E1 31	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0
10 E1 32	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
10 E1 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 E1 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
10 E1 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 E1 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 E1 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 E1 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 E1 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 E1 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 E1 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 E1 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 E1 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 E1 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 E1 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 E1 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 E1 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 E1 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 E1 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 E1 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 E1 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 E1 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 F2 01	0	38	0	1	0	1	40	0	0	0	1	18	0	0	0	1	8	1	0	0
10 F2 02	0	43	1	0	0	2	40	0	0	0	6	28	0	0	0	1	12	0	0	0
10 F2 03	4	15	0	0	0	5	16	1	1	0	8	24	0	0	0	6	10	0	0	0
10 F2 04	2	13	0	0	0	19	16	1	0	0	14	26	1	0	0	2	12	0	0	0

APPENDIX I: *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
10 F2 05	0	11	0	0	0	7	11	0	0	1	3	18	1	0	0	2	14	2	0	0
10 F2 06	3	6	0	0	1	1	8	0	1	0	0	19	1	0	0	0	6	0	1	0
10 F2 07	0	11	1	0	0	0	15	0	0	0	2	14	1	0	0	0	10	0	0	0
10 F2 08	1	10	0	0	0	1	9	0	0	0	1	6	0	0	0	1	4	0	0	0
10 F2 09	0	5	0	0	0	0	5	0	0	0	1	7	0	0	0	0	1	0	0	0
10 F2 10	1	5	0	0	1	0	3	1	0	0	0	11	0	0	0	0	5	0	0	0
10 F2 11	0	6	0	0	0	0	4	0	0	0	0	7	0	0	0	0	8	1	0	0
10 F2 12	0	7	0	0	0	0	4	0	0	0	0	6	0	0	0	0	9	0	0	0
10 F2 13	0	11	0	0	0	1	5	0	0	0	0	8	0	0	0	0	4	0	1	0
10 F2 14	0	3	0	0	0	0	1	0	0	0	1	7	0	0	0	0	8	0	0	0
10 F2 15	0	1	0	0	0	0	6	0	0	0	0	5	0	0	0	0	9	0	0	0
10 F2 16	0	0	0	0	0	0	4	0	0	0	0	4	0	0	0	0	0	0	0	0
10 F2 17	0	2	0	0	0	0	3	0	0	0	0	2	0	0	0	0	2	0	0	0
10 F2 18	0	1	0	0	0	0	5	0	0	0	0	1	1	0	0	0	1	0	0	0
10 F2 19	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0
10 F2 20	0	1	0	0	0	1	0	0	0	0	1	6	0	0	0	1	3	0	0	0
10 F2 21	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	1	0	0	0
10 F2 22	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
10 F2 23	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
10 F2 24	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
10 F2 25	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
10 F2 26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 F2 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
10 F2 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 F2 29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 F2 30	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 F2 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 F2 32	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
10 F2 33	0	1	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
10 F2 34	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 F2 35	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 F2 36	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 F2 37	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 F2 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 F2 39	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
10 F2 40	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 F2 41	0	3	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
10 F2 42	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 F2 43	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 F2 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 F2 45	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
10 F2 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
10 F2 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 F2 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 F2 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 F2 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 F2 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 F2 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 J1 01	1	30	0	0	0	2	21	1	0	0	1	29	0	0	0	0	18	0	0	0
10 J1 02	2	21	0	0	0	0	25	2	0	0	0	26	1	0	0	0	22	3	0	0
10 J1 03	1	19	0	0	0	2	27	1	0	0	2	23	0	0	0	4	14	0	0	0
10 J1 04	0	10	0	0	0	0	16	0	0	0	2	20	1	0	0	1	16	1	0	0
10 J1 05	0	14	4	0	0	2	10	0	0	0	3	12	1	0	0	3	15	1	0	0
10 J1 06	0	14	1	0	0	2	9	0	0	0	3	13	0	2	0	4	13	1	0	0
10 J1 07	2	16	0	0	0	1	11	0	0	0	1	10	1	0	0	2	12	0	0	0
10 J1 08	1	8	0	0	0	3	9	0	0	0	0	5	0	0	1	0	16	0	0	0
10 J1 09	2	7	0	0	0	1	12	0	1	1	0	4	0	0	1	0	13	0	0	0
10 J1 10	2	16	1	0	0	1	9	0	0	1	3	15	0	0	0	1	5	1	0	0
10 J1 11	4	7	0	0	0	7	7	0	0	1	1	15	0	0	0	1	8	0	0	0
10 J1 12	3	8	0	0	0	0	7	1	0	0	1	6	0	0	0	3	7	0	0	0
10 J1 13	5	9	1	0	0	5	9	0	0	0	1	17	1	0	0	1	9	1	0	0
10 J1 14	3	17	0	0	0	3	11	1	0	0	0	10	0	0	0	1	11	0	0	0
10 J1 15	4	10	0	0	0	4	14	0	0	0	1	14	0	0	0	1	18	0	0	0
10 J1 16	2	7	0	0	0	1	7	1	0	0	1	6	0	0	0	2	6	0	0	0
10 J1 17	2	5	0	0	0	0	3	0	0	0	1	15	0	0	0	2	12	0	0	0
10 J1 18	0	7	0	0	0	1	4	0	0	0	0	4	0	1	0	2	9	0	0	0
10 J1 19	0	5	0	0	0	0	3	0	0	0	1	5	0	0	1	1	10	0	0	0
10 J1 20	0	4	0	0	0	0	6	1	0	0	1	5	0	0	0	0	7	0	0	0
10 J1 21	2	5	1	0	0	0	5	0	0	0	0	7	0	0	0	0	1	0	0	0
10 J1 22	1	8	0	0	0	0	7	0	0	0	1	11	0	0	0	0	5	0	0	0
10 J1 23	0	2	0	0	0	0	2	0	0	0	0	7	0	0	0	0	7	0	0	0
10 J1 24	0	0	0	0	0	0	1	0	0	0	0	8	0	0	0	0	9	0	0	0
10 J1 25	0	1	0	0	0	0	3	0	0	0	0	3	0	0	0	0	2	0	0	0
10 J1 26	1	2	0	0	0	0	3	0	0	0	0	4	1	0	0	0	2	0	0	0
10 J1 27	1	2	0	0	0	0	2	0	0	0	0	9	0	0	0	0	1	0	0	0
10 J1 28	0	0	0	0	0	0	5	0	0	0	0	2	0	0	0	0	0	0	0	0
10 J1 29	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
10 J1 30	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
10 J1 31	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0
10 J1 32	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0
10 J1 33	0	0	0	0	0	0	1	0	0	0	0	4	0	0	0	0	0	0	0	0
10 J1 34	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
10 J1 35	0	1	0	0	0	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0
10 J1 36	0	2	0	0	0	0	3	0	0	0	0	2	0	0	0	1	0	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
10 J1 37	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
10 J1 38	0	1	0	0	0	0	3	1	0	0	0	0	0	0	0	0	2	0	0	0
10 J1 39	0	3	0	0	0	0	2	0	0	0	0	3	0	0	0	0	0	0	0	0
10 J1 40	0	4	0	0	0	0	11	0	0	0	0	19	0	0	0	0	3	0	0	0
10 J1 41	0	1	0	0	0	0	8	0	0	0	0	6	0	0	0	0	2	0	0	0
10 J1 42	0	1	0	0	0	0	5	0	0	0	0	4	0	0	0	0	0	0	0	0
10 J1 43	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0
10 J1 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 J1 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 J1 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 J1 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 J1 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 J1 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 J1 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 J1 51	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
10 J1 52	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0
10 K4 01	0	16	1	1	0	0	24	0	0	0	0	1	1	0	0	3	30	0	2	0
10 K4 02	3	24	0	0	0	3	31	1	0	0	2	55	1	0	0	4	25	0	2	0
10 K4 03	1	36	0	0	0	1	30	0	1	0	2	23	1	2	1	4	18	0	0	0
10 K4 04	4	27	0	0	0	2	23	0	0	0	2	17	0	0	0	1	10	1	0	2
10 K4 05	2	23	0	0	0	5	18	0	0	0	5	19	0	0	0	0	13	1	0	0
10 K4 06	1	18	1	0	0	0	22	0	0	0	3	21	0	0	0	1	11	0	0	0
10 K4 07	3	12	0	0	0	4	17	0	0	0	1	11	0	0	0	2	11	0	0	0
10 K4 08	2	17	0	0	0	3	19	0	1	0	0	11	0	0	0	0	5	0	0	0
10 K4 09	1	16	0	0	0	3	14	0	0	0	1	12	0	0	0	0	5	0	0	0
10 K4 10	0	12	0	0	0	1	6	0	0	0	0	6	0	0	0	0	4	0	0	0
10 K4 11	2	9	0	0	0	3	8	0	0	0	3	7	0	0	0	3	14	0	0	0
10 K4 12	2	13	0	0	0	2	10	0	0	0	2	13	0	0	0	2	10	0	0	0
10 K4 13	0	10	0	0	0	5	19	0	0	0	1	11	0	0	0	5	16	0	0	0
10 K4 14	0	8	0	0	0	0	12	0	0	0	0	6	0	0	0	7	9	0	0	0
10 K4 15	2	11	0	0	0	0	7	0	0	0	0	5	0	0	0	0	4	0	0	0
10 K4 16	0	8	0	0	0	0	13	0	0	0	1	8	0	0	0	0	1	0	0	0
10 K4 17	0	16	0	0	0	0	7	0	0	0	0	6	0	0	0	1	4	0	0	0
10 K4 18	2	3	0	0	0	0	5	0	0	0	0	6	0	1	0	0	7	0	0	0
10 K4 19	0	2	0	0	0	0	10	0	0	0	0	9	0	0	0	0	4	0	0	0
10 K4 20	0	3	0	0	0	0	6	0	0	0	0	7	0	0	0	0	2	0	0	0
10 K4 21	0	1	0	0	0	0	1	0	0	0	0	2	0	0	0	0	1	0	0	0
10 K4 22	0	5	0	0	0	0	6	0	0	0	1	5	0	0	0	1	0	0	0	0
10 K4 23	0	1	0	0	0	0	3	0	0	0	1	9	0	0	0	0	2	0	0	0
10 K4 24	0	1	0	0	0	0	3	0	0	0	0	4	0	0	0	0	1	0	0	0
10 K4 25	0	2	0	0	0	0	1	0	0	0	0	4	0	0	0	0	3	0	0	0
10 K4 26	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A 1	A 2	A 3	A 4	A 5	B 1	B 2	B 3	B 4	B 5	C 1	C 2	C 3	C 4	C 5	D 1	D 2	D 3	D 4	D 5
10 K4 27	0	4	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0
10 K4 28	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
10 K4 29	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
10 K4 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
10 K4 31	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
10 K4 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
10 K4 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
10 K4 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 K4 35	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
10 K4 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 K4 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 K4 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 K4 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 K4 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 K4 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 K4 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 K4 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 K4 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 K4 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 K4 46	0	2	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
10 K4 47	0	4	0	0	0	0	5	0	0	0	0	6	0	0	0	0	2	0	0	0
10 K4 48	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0
10 K4 49	0	0	0	0	0	0	3	0	0	0	0	2	0	0	0	0	1	0	0	0
10 K4 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 K4 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 K4 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 D1 01	4	23	1	0	0	6	11	0	1	0	9	17	0	0	0	1	20	2	0	0
11 D1 02	5	17	0	0	0	2	31	1	1	0	3	17	1	0	0	8	12	0	1	0
11 D1 03	5	21	0	0	0	0	33	0	0	0	4	17	2	0	0	9	15	1	0	0
11 D1 04	3	23	1	0	0	0	20	2	0	0	1	18	1	0	0	4	23	0	1	0
11 D1 05	2	6	0	1	0	2	21	0	0	0	2	12	0	0	0	1	10	0	0	0
11 D1 06	1	1	0	1	0	1	7	0	0	0	0	9	0	0	0	0	11	0	1	0
11 D1 07	0	1	0	0	0	0	9	0	1	0	0	3	0	0	0	0	7	0	0	0
11 D1 08	0	3	0	0	0	0	11	0	0	0	1	11	0	0	0	0	7	0	0	0
11 D1 09	0	2	0	0	0	0	4	0	0	0	0	11	0	0	0	0	5	0	0	0
11 D1 10	0	4	0	0	0	0	4	0	0	0	0	1	1	0	0	0	9	0	0	0
11 D1 11	0	1	0	0	0	1	0	0	0	0	1	5	0	0	0	1	6	0	0	0
11 D1 12	0	2	0	0	0	0	2	0	0	0	1	3	0	0	0	0	2	0	0	0
11 D1 13	0	2	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
11 D1 14	0	1	1	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0
11 D1 15	0	1	0	0	0	0	1	0	0	0	0	2	0	0	0	0	3	0	0	0
11 D1 16	1	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
11 D1 17	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 D1 18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
11 D1 19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 D1 20	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0
11 D1 21	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
11 D1 22	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
11 D1 23	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
11 D1 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 D1 25	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
11 D1 26	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
11 D1 27	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
11 D1 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 D1 29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 D1 30	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
11 D1 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
11 D1 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 D1 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 D1 34	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
11 D1 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 D1 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 D1 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 D1 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 D1 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 E1 01	4	36	0	0	0	9	41	0	0	0	4	33	1	0	0	3	34	0	0	0
11 E1 02	3	37	0	0	0	3	22	0	0	0	7	31	0	1	0	4	19	1	0	0
11 E1 03	2	35	0	0	0	2	20	1	1	0	4	43	0	1	0	6	22	0	0	1
11 E1 04	1	39	0	0	0	3	43	0	0	0	2	30	1	0	0	4	24	0	0	0
11 E1 05	0	17	0	1	0	2	29	0	0	0	0	12	1	1	0	1	8	0	0	0
11 E1 06	0	21	0	0	0	0	15	0	0	0	0	10	1	0	0	0	8	1	0	0
11 E1 07	0	23	0	0	0	1	19	0	0	0	0	23	0	0	0	1	2	0	0	0
11 E1 08	0	8	0	0	0	0	13	0	0	0	0	11	0	0	0	0	2	0	0	0
11 E1 9	1	7	0	0	0	0	3	0	0	0	1	4	0	0	0	1	2	0	0	0
11 E1 10	0	5	0	0	0	0	2	0	0	0	1	5	0	0	0	0	5	0	0	0
11 E1 11	0	5	0	0	0	0	3	0	0	0	0	5	0	0	0	0	7	0	0	0
11 E1 12	0	2	1	0	0	0	3	0	0	0	0	8	0	0	0	0	7	0	0	0
11 E1 13	0	6	0	0	0	0	1	0	0	0	0	2	0	0	0	0	1	0	0	0
11 E1 14	0	3	0	0	0	0	5	0	0	0	0	5	0	0	0	0	1	0	0	0
11 E1 15	0	3	0	0	0	0	3	0	0	0	0	3	0	0	0	0	2	0	0	0
11 E1 16	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	0	0	0
11 E1 17	0	2	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0
11 E1 18	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	2	0	0	0
11 E1 19	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
11 E1 20	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0
11 E1 21	0	1	0	0	0	0	3	0	0	0	0	2	0	0	0	0	2	1	0	0
11 E1 22	0	2	0	0	0	0	2	0	0	0	0	2	0	0	0	0	1	0	0	0
11 E1 23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 E1 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 E1 25	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
11 E1 26	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
11 E1 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
11 E1 28	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0
11 E1 29	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0	0	2	0	0	0
11 E1 30	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
11 E1 31	1	2	0	0	0	0	0	0	0	0	1	2	0	0	0	0	1	0	0	0
11 E1 32	0	3	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
11 E1 33	0	2	0	0	0	0	1	0	0	0	1	2	0	0	0	0	0	0	0	0
11 E1 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 E1 35	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
11 E1 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 E1 37	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
11 E1 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 E1 39	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
11 E1 40	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
11 E2 01	3	46	0	0	0	7	30	7	0	0	7	30	1	0	0	8	14	0	0	0
11 E2 02	3	27	1	1	0	2	15	0	1	0	4	16	0	1	0	1	15	0	1	0
11 E2 03	2	16	1	0	0	1	15	0	0	0	2	17	0	1	0	3	12	0	1	0
11 E2 04	3	15	1	0	0	0	17	0	0	0	3	20	1	0	0	1	13	0	1	0
11 E2 05	1	15	1	0	0	0	10	0	0	0	1	10	0	0	0	1	9	0	0	0
11 E2 06	2	8	0	0	0	4	7	0	0	0	0	3	0	0	0	0	5	0	0	0
11 E2 07	1	11	0	0	0	0	6	0	0	0	0	0	1	0	0	0	5	0	1	0
11 E2 08	1	5	0	0	0	0	2	0	0	0	0	5	0	1	0	0	9	0	1	0
11 E2 09	0	3	0	0	0	0	5	0	0	0	0	1	0	0	1	0	11	0	0	0
11 E2 10	1	3	0	0	0	1	8	0	0	0	1	6	0	0	0	0	5	0	0	0
11 E2 11	1	4	0	0	0	0	3	0	0	0	3	5	0	0	0	0	6	0	0	0
11 E2 12	0	4	0	0	0	0	1	1	0	0	2	4	0	0	0	0	4	0	0	0
11 E2 13	0	2	1	0	0	0	5	0	0	0	0	4	0	0	0	0	5	0	0	0
11 E2 14	0	3	0	0	0	0	5	0	0	0	0	4	0	0	0	0	4	0	0	0
11 E2 15	1	3	0	0	0	0	2	0	0	0	1	3	0	0	0	1	4	0	0	0
11 E2 16	0	3	0	0	0	0	3	0	0	0	0	4	0	0	0	0	1	0	0	0
11 E2 17	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	2	0	0	0
11 E2 18	0	0	0	0	0	0	5	0	0	0	0	1	0	0	0	0	3	0	0	0
11 E2 19	0	0	0	0	0	0	1	0	0	0	1	1	1	0	0	0	1	0	0	0
11 E2 20	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
11 E2 21	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
11 E2 22	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
11 E2 23	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0
11 E2 24	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
11 E2 25	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
11 E2 26	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 E2 27	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 E2 28	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0
11 E2 29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 E2 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 E2 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 E2 32	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 E2 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 E2 34	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 E2 35	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 E2 36	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 E2 37	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
11 E2 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 F4 01	3	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 F4 02	7	11	2	0	0	8	6	1	0	0	4	14	2	0	0	7	10	0	0	0
11 F4 03	4	8	0	0	1	10	8	0	0	0	11	15	0	1	0	15	10	0	0	0
11 F4 04	7	8	0	0	0	5	8	2	0	0	10	6	1	0	0	4	10	2	0	0
11 F4 05	2	9	0	0	0	4	12	0	0	0	10	6	0	0	0	13	7	1	0	0
11 F4 06	0	8	1	0	0	2	10	0	0	1	2	4	0	0	0	3	5	0	0	1
11 F4 07	0	4	0	0	1	1	6	1	0	0	1	8	0	1	0	0	4	0	0	0
11 F4 08	0	7	0	0	0	0	5	0	0	0	1	14	0	0	0	2	7	0	0	0
11 F4 09	0	3	0	1	0	1	4	0	0	0	0	6	0	0	0	0	4	0	0	0
11 F4 10	0	2	0	0	0	0	4	0	0	0	0	5	0	0	0	0	3	0	0	0
11 F4 11	0	1	0	0	0	0	3	0	0	0	0	5	0	0	0	0	1	0	0	0
11 F4 12	0	1	0	0	0	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0
11 F4 13	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
11 F4 14	0	2	0	0	0	0	2	0	0	0	0	1	0	0	0	0	1	0	0	0
11 F4 15	0	0	0	0	0	0	4	0	0	0	0	1	0	0	0	0	0	0	0	1
11 F4 16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
11 F4 17	0	1	0	0	0	0	2	0	0	0	0	1	0	0	0	0	1	0	0	0
11 F4 18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 F4 19	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0
11 F4 20	0	1	0	0	0	0	2	0	0	0	0	1	0	0	0	0	2	0	0	0
11 F4 21	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
11 F4 22	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0
11 F4 23	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0
11 F4 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 F4 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX I: *Continued*

Subplot			A					B					C					D		
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
11 F4 26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
11 F4 27	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
11 F4 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 F4 29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 F4 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 F4 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 F4 32	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
11 F4 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 F4 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 F4 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 F4 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 F4 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 F4 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 F4 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 F4 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 J1 01	14	15	0	0	0	9	12	1	1	0	4	16	1	1	0	9	29	1	0	0
11 J1 02	8	27	0	1	0	3	24	0	0	0	2	16	0	0	0	3	12	0	0	0
11 J1 03	2	18	0	0	0	2	21	1	0	0	0	17	1	0	0	4	7	1	0	0
11 J1 04	0	6	0	0	0	0	17	0	0	0	0	15	1	0	0	0	12	1	0	0
11 J1 05	1	14	0	0	0	1	19	1	0	0	0	15	0	0	0	0	14	0	0	0
11 J1 06	0	5	0	0	0	0	16	0	0	0	0	12	0	0	0	0	11	0	0	0
11 J1 07	2	10	0	0	0	0	19	0	0	0	0	10	0	0	0	0	5	0	0	0
11 J1 08	0	7	0	0	0	0	8	0	0	0	1	7	0	0	0	0	8	0	0	0
11 J1 09	0	9	0	0	0	0	0	0	0	0	0	5	0	0	0	0	7	0	0	1
11 J1 10	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	4	0
11 J1 11	1	13	0	0	0	0	0	0	0	0	0	5	0	0	0	0	5	0	0	0
11 J1 12	0	7	0	0	0	1	6	0	0	0	0	6	0	0	0	0	6	0	0	0
11 J1 13	0	6	0	0	0	0	7	0	0	0	1	1	0	0	0	0	2	0	0	0
11 J1 14	0	4	0	0	0	1	4	0	0	0	1	2	0	0	0	0	2	0	0	0
11 J1 15	0	5	0	0	0	0	0	0	0	0	0	3	0	0	0	2	5	0	0	0
11 J1 16	0	4	0	0	0	0	1	1	0	0	0	6	0	0	0	0	5	0	0	0
11 J1 17	0	3	0	0	0	0	1	0	0	0	0	3	0	0	0	0	1	0	0	0
11 J1 18	0	6	0	0	0	0	3	0	0	0	0	4	0	0	0	1	4	0	0	0
11 J1 19	1	6	0	0	0	0	3	0	0	0	0	5	0	0	0	0	5	0	0	0
11 J1 20	0	3	0	0	0	0	3	0	0	0	0	2	0	0	0	0	8	0	0	0
11 J1 21	0	2	0	0	0	0	4	0	0	0	0	2	0	0	0	0	2	0	0	0
11 J1 22	0	4	0	0	0	0	2	0	0	0	0	3	0	0	0	0	6	0	0	0
11 J1 23	0	3	0	0	0	0	1	0	0	0	0	2	0	0	0	0	3	0	0	0
11 J1 24	0	4	0	0	0	0	3	0	0	0	0	3	0	0	0	0	0	0	0	0
11 J1 25	0	2	0	0	0	0	2	0	0	0	0	4	0	0	0	0	2	0	0	0
11 J1 26	0	3	0	0	0	0	2	0	0	0	0	3	0	0	0	0	1	0	0	0
11 J1 27	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
11 J1 28	0	1	0	0	0	0	4	0	0	0	0	3	0	0	0	0	1	0	0	0
11 J1 29	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
11 J1 30	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 J1 31	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 J1 32	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
11 J1 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 J1 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
11 J1 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 J1 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 J1 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 J1 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 J1 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 K1 01	26	8	0	0	0	14	10	1	0	0	4	29	0	0	0	12	9	0	1	0
11 K1 02	6	12	0	0	0	5	14	1	0	0	7	20	0	1	0	3	15	1	0	0
11 K1 03	5	18	0	1	0	5	10	1	0	0	4	14	0	0	0	5	9	0	0	0
11 K1 04	2	6	0	0	0	0	5	0	1	0	1	5	0	1	0	1	10	0	0	0
11 K1 05	1	5	0	0	0	1	6	0	0	0	3	11	0	0	0	0	4	0	0	0
11 K1 06	1	2	0	0	0	1	10	0	1	0	3	13	0	0	0	1	8	1	0	0
11 K1 07	1	8	0	0	0	1	6	0	0	0	0	2	0	0	0	0	9	0	1	0
11 K1 08	1	7	0	0	0	2	12	0	0	0	0	2	0	0	0	2	9	0	0	0
11 K1 09	0	6	0	0	0	0	10	0	0	0	2	11	0	0	0	1	12	0	0	0
11 K1 10	2	4	0	0	0	0	3	0	0	0	0	5	0	0	0	0	5	0	0	0
11 K1 11	0	7	0	0	0	1	5	0	0	0	0	4	0	0	0	1	6	1	0	0
11 K1 12	0	3	0	0	0	0	5	0	0	0	2	3	0	0	0	0	2	0	0	0
11 K1 13	0	0	0	0	0	0	6	0	0	0	0	4	0	0	0	0	4	0	0	0
11 K1 14	0	0	0	0	0	0	3	0	0	0	0	5	0	0	0	0	2	0	0	0
11 K1 15	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0
11 K1 16	0	0	0	0	0	0	1	0	0	0	0	3	0	0	0	0	0	0	0	0
11 K1 17	0	5	0	0	0	0	5	0	0	0	0	3	0	0	0	0	1	0	0	0
11 K1 18	0	1	0	0	0	0	2	0	0	0	0	1	0	0	0	0	3	0	0	0
11 K1 19	0	2	0	0	0	0	0	0	0	0	0	3	0	0	0	0	2	0	0	0
11 K1 20	1	1	0	0	0	0	4	0	0	0	0	4	0	0	0	0	3	0	0	0
11 K1 21	0	0	0	0	0	0	4	0	0	0	0	6	0	0	0	1	3	0	0	0
11 K1 22	0	0	0	0	0	0	5	0	0	0	0	4	0	0	0	0	3	0	0	0
11 K1 23	0	3	0	0	0	0	4	0	0	0	0	4	0	0	0	0	3	0	0	0
11 K1 24	0	4	0	0	0	0	1	0	0	0	0	2	0	0	0	2	2	0	0	0
11 K1 25	1	1	0	0	0	0	3	0	0	0	2	1	0	0	0	0	3	0	0	0
11 K1 26	0	6	0	0	0	0	4	0	0	0	0	4	0	0	0	0	1	0	0	0
11 K1 27	0	7	0	0	0	0	1	0	0	0	2	1	0	0	0	0	2	0	0	0
11 K1 28	0	3	0	0	0	0	1	0	0	0	1	3	0	0	0	0	4	0	0	0
11 K1 29	0	3	0	0	0	0	1	0	0	0	0	1	0	0	0	0	5	0	0	0
11 K1 30	0	4	0	0	0	0	1	0	0	0	0	0	0	0	0	0	3	0	0	0

APPENDIX I. *Continued*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
11 K1 31	0	3	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
11 K1 32	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 K1 33	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 K1 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 K1 35	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
11 K1 36	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
11 K1 37	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 K1 38	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
11 K1 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 K1 40	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 K2 01	10	12	2	0	0	7	2	0	0	0	12	1	1	0	0	2	6	0	0	0
11 K2 02	5	13	0	0	0	8	24	0	0	0	8	14	2	0	0	6	13	0	0	0
11 K2 03	1	7	1	1	0	2	10	1	0	0	8	13	1	1	0	2	6	0	0	0
11 K2 04	4	6	0	0	0	3	6	0	0	0	1	6	1	0	0	0	4	0	0	0
11 K2 05	3	3	0	0	0	3	4	0	0	0	3	4	0	0	0	0	7	0	0	0
11 K2 06	1	5	1	0	0	2	6	0	0	0	0	10	0	0	0	2	5	0	0	0
11 K2 07	2	7	1	0	0	2	5	0	0	0	2	8	1	0	0	3	2	0	0	0
11 K2 08	0	6	0	0	0	0	2	0	0	0	0	7	1	0	0	0	4	0	0	0
11 K2 09	0	5	0	0	0	0	3	0	0	0	0	3	0	0	0	1	5	0	0	1
11 K2 10	0	6	0	0	0	1	1	2	0	0	0	1	0	0	0	0	5	0	0	0
11 K2 11	0	5	0	0	0	0	3	1	0	0	2	6	0	0	0	0	4	0	0	0
11 K2 12	0	4	0	0	0	0	2	0	0	0	0	0	0	0	0	1	3	0	0	0
11 K2 13	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	5	0	0	0
11 K2 14	2	1	0	0	0	0	0	0	0	0	0	6	0	0	0	1	5	0	0	0
11 K2 15	0	4	0	0	0	1	1	0	0	0	0	3	0	0	0	1	4	0	0	0
11 K2 16	0	3	0	0	0	0	3	0	0	0	0	5	0	0	0	0	2	0	0	0
11 K2 17	1	6	0	0	0	0	1	0	0	0	0	3	0	0	0	0	2	0	0	0
11 K2 18	0	2	0	0	0	0	1	0	0	0	0	2	0	0	0	0	1	0	0	0
11 K2 19	0	1	0	0	0	0	3	0	0	0	0	0	0	0	0	0	1	0	0	0
11 K2 20	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
11 K2 21	0	1	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0
11 K2 22	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	2	0	0	0
11 K2 23	0	2	0	0	0	0	2	0	0	0	0	3	0	0	0	0	1	0	0	0
11 K2 24	0	4	0	0	0	0	3	0	0	0	0	5	0	0	0	0	2	0	0	0
11 K2 25	0	3	0	0	0	0	3	0	0	0	0	0	0	0	0	0	3	0	0	0
11 K2 26	0	3	0	0	0	0	3	0	0	0	0	1	0	0	0	0	3	0	0	0
11 K2 27	0	0	0	0	0	0	2	0	0	0	0	4	0	0	0	0	4	0	0	0
11 K2 28	0	4	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0
11 K2 29	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
11 K2 30	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
11 K2 31	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
11 K2 32	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0

APPENDIX I. *Concluded*

Subplot	A					B					C					D				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
11 K2 33	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
11 K2 34	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
11 K2 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
11 K2 36	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 K2 37	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
11 K2 38	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 K2 39	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
11 K2 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0

APPENDIX II

PLANT WATER POTENTIAL DATA AND CORRECTIONS

Appendix ~~II~~ contain plant water potential data as measured with a Scholander Pressure Bomb and associated corrections. The following is a summary of each column found in the Appendix.

Column	**Description**
Date	Date of Sampling
Time	Mountain Standard Time
A	Cloud Conditions
	C- Clear (<10% cloud cover).
	PC - Partially Cloudy (10-30% cloud cover)
	H - Haze (10-30% cloud cover)
	CL - Cloudy (t 30-80% cloud cover)
	O or F - Overcast or Foggy (>80% cloud cover)
B	Raw Scholander Pressure Bomb Readings (-MPa)
C	Diurnal Plant Water Potential Correction
D	Correction for Cloud Cover
	C = 1.0, PC or H = 0.75, CL = 0.50, O or F = 0.25
E	C x D
F	Estimated Plant Water Potential at 0700 hrs (B - E)

Date	Time	A	B	C	D	E	F
Abies balsamea - Plot 4							
May 10	0820	C	-6.5	4.5	1.0	4.5	-2.0
May 14	1140	C	-10.0	13.5	1.0	13.5	+3.5
May 18	0825	C	-9.0	4.5	1.0	4.5	-4.5
May 22	1055	C	-14.0	14.0	1.0	14.0	-0.0
May 26	1045	CL	-10.0	13.4	0.5	6.7	-3.3
May 30	0940	C	-9.0	9.7	1.0	9.7	+0.7
June 3	1040	C	-15.0	13.0	1.0	13.0	-2.0
June 7	0730	C	-8.5	1.0	1.0	1.0	-7.5
June 11	1030	C	-22.0	12.8	1.0	12.8	-9.2
June 15	0945	C	-18.0	10.4	1.0	10.4	-7.6
June 19	0830	S	-13.0	4.5	0.75	3.4	-9.6
June 23	0825	PC	-11.0	4.5	0.75	3.4	-7.6
June 27	0830	CL	-13.0	4.5	0.5	2.3	-10.7
July 1	0855	O	-5.5	7.0	0.25	1.8	-3.7
July 5	0920	O	-4.5	8.4	0.25	1.7	-2.8
July 9	0815	C	-9.0	3.3	1.0	3.3	-5.7
July 13	0715	C	-7.0	0.5	1.0	0.5	-6.5
July 17	0720	SF	-9.0	0.7	0.25	0.2	-8.8
July 21	1030	O	-10.0	12.8	0.25	3.2	-6.8
July 25	0900	H	-9.0	7.0	0.75	5.3	-3.7
July 29	0800	C	-5.5	2.0	1.0	2.0	-3.5
Aug 2	0820	O	-4.0	3.7	1.0	3.7	-0.3
Aug 6	1030	O	-13.5	12.8	0.25	3.1	-10.4
Aug 10	0805	O	-7.0	2.0	0.25	0.5	-6.5
Aug 14	0720	O	-5.0	0.6	0.25	0.2	-4.8
Aug 18	0805	C	-8.5	2.0	1.0	2.0	-6.5
Aug 22	0905	PC	-8.5	7.0	0.6	4.2	-4.3
Abies balsamea - Plot 6							
May 10	0715	C	-5.0	0.4	1.0	0.4	-4.6
May 14	1020	C	-2.5	5.5	1.0	5.5	+3.0
May 18	0710	C	-1.0	0.3	1.0	0.3	-0.7
May 22	1000	C	-14.5	5.0	1.0	5.0	-9.5
May 26	0955	C	-1.0	5.0	1.0	5.0	+4.0
May 30	0835	C	-9.5	2.5	1.0	2.5	-7.0
June 3	1205	C	-13.0	8.5	1.0	8.5	-4.5
June 7	0900	C	-10.5	3.4	1.0	3.4	-7.1
June 11	1205	CL	-11.0	8.5	0.5	4.3	-7.7
June 15	0820	C	-12.5	2.2	1.0	2.2	-10.3
June 19	0645	CL	+0.4	0.5	0.5	+0.2	-0.6
June 23	0935	PC	-4.2	4.2	0.75	3.2	-12.3
June 27	0850	CL	-12.0	1.3	0.5	0.7	-11.3
July 1	0745	O	-3.0	1.2	0.25	0.3	-2.7
July 5	0815	O	-2.5	0.5	0.25	0.1	-2.4
July 9	0940	C	-9.5	4.4	1.0	4.4	-5.1
July 13	0745	C	-7.5	1.2	1.0	1.2	-6.3
July 17	0810	C	-12.0	1.9	1.0	1.9	-10.1
July 21	0925	CL	-7.0	4.2	0.5	2.1	-4.9

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
July 25	1035	H	-11.5	5.9	0.75	4.4	-7.1
July 29	0710	C	-4.0	0.3	1.0	0.3	-3.7
Aug 2	0705	O	-7.0	0.0	0.25	0.0	-7.0
Aug 6	1145	CL	-11.0	8.0	0.5	4.0	-7.0
Aug 10	0650	H	-4.5	+0.3	0.75	+0.2	-4.7
Aug 14	0805	O	-5.0	1.6	0.25	0.4	-4.6
Aug 18	0710	C	-4.0	0.3	1.0	0.3	-3.7
Aug 22	1015	PC	-8.0	5.4	0.75	4.6	-3.4
Alnus crispa - Plot 1							
June 27	1200	PC	-12.5	10.1	0.75	7.6	-4.9
July 1	1200	PC	-11.5	10.1	0.75	7.6	-3.9
July 5	1125	CL	-9.0	9.7	0.5	4.9	-4.1
July 9	1230	C	-13.5	10.0	1.0	10.0	-3.5
July 13	1045	C	-14.5	9.0	1.0	9.0	-5.5
July 17	1245	PC	-17.0	10.0	0.75	7.5	-9.5
July 21	0645	O	-3.0	+0.7	0.25	1.6	-1.4
July 25	1205	H	-12.5	10.1	0.75	7.6	-4.9
July 29	1020	C	-10.0	8.4	1.0	8.4	-1.6
Aug 2	0955	O	-3.0	7.8	0.25	2.0	-1.0
Aug 6	0720	CL	-4.5	1.3	0.5	0.7	-3.8
Aug 10	1005	O	-6.5	7.8	0.25	2.0	-4.5
Aug 14	1020	O	-5.5	8.4	0.25	4.1	-1.4
Aug 18	1030	C	-13.0	8.6	1.0	8.6	-4.4
Aug 22	0700	PC	-0.0	0.0	0.75	0.0	-0.0
Alnus crispa - Plot 2							
June 3	0825	C	-7.5	3.9	1.0	3.9	-3.6
June 7	1155	C	-12.0	10.1	1.0	10.1	-1.9
June 11	0750	C	-7.0	2.0	1.0	2.0	-5.0
June 15	1235	C	-16.5	10.0	1.0	10.0	-6.5
June 19	1150	C	-16.0	10.1	1.0	10.1	-5.9
June 23	1110	C	-13.5	10.1	1.0	10.1	-3.4
June 27	1130	CL	-10.5	9.8	0.5	4.9	-5.6
July 1	1120	CL	-6.0	9.7	0.5	4.9	-1.1
July 5	0710	O	-2.0	0.7	0.25	0.2	-1.8
July 9	1210	C	-12.5	10.1	1.0	10.1	-2.4
July 13	1110	C	-13.0	9.7	1.0	9.7	-3.3
July 17	1220	PC	-15.0	10.1	0.75	7.6	-7.4
July 21	0750	O	-3.5	-2.0	0.25	0.5	-3.0
July 25	0720	H	-2.0	0.7	0.75	0.5	-1.5
July 29	1000	C	-16.5	7.8	1.0	7.8	-8.7
Aug 2	1040	O	-2.5	9.1	0.25	2.3	-0.2
Aug 6	0830	CL	-5.0	3.9	0.50	2.0	-3.0
Aug 10	1050	O	-7.5	9.1	0.25	2.3	-5.2
Aug 14	1000	O	-6.5	7.8	0.25	2.0	-4.5
Aug 18	1000	C	-12.0	7.8	1.0	7.8	-4.2
Aug 22	0720	CL	-2.0	0.7	0.5	0.3	-1.7

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
Alnus crispa - Plot 3							
June 3	0915	C	-9.0	5.9	1.0	5.9	-3.1
June 7	1225	C	-10.0	10.1	1.0	10.1	-0.0
June 11	0940	C	-14.0	7.2	1.0	7.2	-6.8
June 15	1130	C	-16.5	9.8	1.0	9.8	-6.7
June 19	1030	C	-8.5	8.7	1.0	8.7	-0.2
June 23	0705	S	-6.5	0.0	0.9	0.0	-6.5
June 27	1015	CL	-7.0	8.2	0.5	4.1	-2.9
July 1	0940	O	-3.0	7.2	0.25	1.8	-1.2
July 5	1045	O	-3.5	9.1	0.25	2.3	-1.2
July 9	0710	C	-5.0	0.7	1.0	0.7	-4.3
July 13	0945	C	7.0	7.2	1.0	7.2	+0.2
July 17	1105	C	-11.0	9.5	1.0	9.5	-1.5
July 21	0850	O	-3.5	4.6	0.25	1.1	-2.4
July 25	0920	H	-3.5	3.3	0.75	2.4	-1.1
July 29	0915	C	-7.0	5.9	1.0	5.9	-1.2
Aug 2	0925	O	-2.0	6.5	0.25	1.6	-0.4
Aug 6	0940	CL	-7.0	7.2	0.5	3.6	-3.4
Aug 10	0905	O	-6.0	5.2	0.25	1.3	-4.7
Aug 14	0915	O	-4.5	5.9	0.25	1.5	-3.0
Aug 18	0910	C	-9.0	5.9	1.0	5.9	-3.1
Aug 22	0815	CL	-2.0	3.3	0.5	1.6	-0.4
Alnus crispa - Plot 9							
May 30	1130	C	-13.5	9.8	1.0	9.8	-3.7
June 3	0950	C	-16.0	7.2	1.0	7.2	-8.8
June 7	1300	CL	-18.5	10.0	0.5	5.0	-13.5
June 11	0905	C	-18.5	5.2	1.0	5.2	-13.3
June 15	1050	C	-14.0	9.1	1.0	9.1	-4.9
June 19	1010	C	-12.5	8.2	1.0	8.2	-4.3
June 23	0720	S	-8.0	0.7	0.9	0.6	-7.4
June 27	0935	CL	-7.5	6.5	0.5	3.3	-4.2
July 1	1000	O	-4.5	7.8	0.25	2.0	-2.5
July 5	1035	O	-3.5	8.7	0.25	2.2	-1.3
July 9	0630	S	-4.5	-1.3	1.0	-1.3	-5.8
July 13	0915	C	-11.0	5.9	1.0	5.9	-5.1
July 17	1035	C	-17.5	8.7	1.0	8.7	-8.8
July 21	0825	CL	-3.5	3.9	0.4	1.6	-1.9
July 25	0750	H	-3.0	2.0	0.75	1.5	-1.5
July 29	0845	C	-6.5	4.6	1.0	4.6	-1.9
Aug 2	0905	O	-1.5	5.2	0.25	1.3	-0.2
Aug 6	0900	CL	-5.0	5.2	0.5	2.6	-2.4
Aug 10	0850	O	-8.0	4.6	0.25	1.1	-6.9
Aug 14	0900	O	-5.0	5.2	0.25	1.3	-3.7
Aug 18	0850	C	-7.5	4.6	1.0	4.6	-2.9
Aug 22	0800	C	-1.0	2.6	1.0	2.6	-1.6
Alnus crispa - Plot 10							
June 3	0810	C	-4.0	0.8	1.0	0.8	-3.2
June 7	1120	C	-4.0	4.8	1.0	0.8	-3.2

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
June 11	0815	C	-6.0	0.8	1.0	0.8	-5.2
June 15	1310	C	-13.5	6.5	1.0	6.5	-7.0
June 19	1100	C	-9.0	4.5	1.0	4.5	-4.5
June 23	1130	C	-9.5	5.0	1.0	5.0	-4.5
June 27	1045	CL	-9.0	4.0	0.5	2.0	-7.0
July 1	1050	CL	-3.0	4.0	0.5	2.0	-1.0
July 5	0640	O	-2.0	+0.1	0.25	0.0	-2.0
July 9	1120	C	-11.0	4.8	1.0	4.8	-6.2
July 13	1145	PC	-14.0	5.3	0.75	3.9	-10.1
July 17	1140	C	-12.5	5.3	1.0	5.3	-7.2
July 21	0710	O	-1.5	0.1	0.25	0.0	-1.5
July 25	0640	H	-2.0	+0.1	0.9	+0.1	-1.9
July 29	0940	C	-3.5	2.3	1.0	2.3	-1.2
Aug 2	1015	O	-2.0	3.0	0.25	0.8	-1.2
Aug 6	0750	CL	-3.0	0.3	0.5	0.2	-2.8
Aug 10	1025	O	-5.5	3.5	0.25	0.9	-2.6
Aug 14	0940	O	-5.5	2.3	0.25	0.6	-4.9
Aug 18	0930	C	-10.0	2.0	1.0	2.0	-8.0
Aug 22	0740	O	-1.5	0.3	0.35	0.1	-1.4
Amelanchier alnifolia - Plot 9							
June 3	0950	C	-21.0	10.7	1.0	10.7	-10.3
June 7	1300	CL	-20.0	15.0	0.5	7.5	-12.5
June 11	0905	C	-10.0	6.5	1.0	6.5	-3.5
June 15	1050	C	-22.5	15.0	1.0	15.0	-7.5
June 19	1010	C	-23.0	12.2	1.0	12.2	-10.8
June 23	0720	S	-20.5	0.75	0.75	0.6	-19.9
June 27	0935	-	-	-	-	-	-
July 1	1000	O	-4.5	11. 5	0.25	2.3	-2.2
July 5	1035	O	-4.0	13.5	0.25	3.4	-0.6
July 9	0630	C	-	-	-	-	-
July 13	0915	C	-14.0	7.5	1.0	7.5	-6.5
July 17	1035	C	-13.0	13.0	1.0	13.0	-0.0
July 21	0825	O	-4.5	4.1	0.35	1.4	-3.1
July 25	0750	H	-4.0	2.9	0.75	2.2	-1.8
July 29	0845	C	-10.0	5.5	1.0	5.5	-4.5
Aug 2	0905	O	-2.5	6.5	0.25	1.6	-0.9
Aug 6	0900	CL	-9.5	6.5	0.5	3.3	-6.2
Aug 10	0850	O	-10.0	5.8	0.25	1.5	-8.5
Aug 14	0900	O	-7.0	6.5	0.25	1.6	-5.4
Aug 18	0850	C	-8.0	5.8	1.0	5.8	-2.2
Aug 22	0800	C	-2.0	2.5	1.0	2.5	+0.5
Arctostaphylos uva-ursi - Plot 1							
May 10	1045	C	-16.0	-12.3	1.0	-12.3	-3.7
May 14	1500	C	-5.5	8.5	1.0	8.5	+3.0
May 18	1105	C	-5.0	12.5	1.0	12.5	+7.5
May 22	0745	C	-7.0	3.0	1.0	3.0	-4.0
May 26	1210	CL	-13.0	12.9	0.5	6.5	-6.5
May 30	1330	CL	-20.5	12.2	0.5	6.1	-14.4

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
June 3	0735	C	-9.0	2.0	1.0	2.0	-7.0
June 7	1100	C	-17.5	12.5	1.0	12.5	-5.0
June 11	0720	C	-13.0	1.0	1.0	1.0	-12.0
June 15	1200	S	-19.5	-13.0	1.0	13.0	-6.5
June 19	0920	S	-26.0	9.3	0.75	6.9	19.1
June 23	1205	PC	-22.5	13.0	0.75	9.8	12.7
June 27	1200	CL	-21.0	13.0	0.5	6.5	-14.5
July 1	1200	CL	-12.5	13.0	0.75	9.8	-2.7
July 5	1125	PC	-5.0	12.8	0.5	6.4	+1.4
July 9	1230	S	-14.0	12.9	1.0	12.9	-1.1
July 13	1045	C	-22.5	12.2	1.0	12.3	-10.2
July 17	1245	C	-20.0	12.8	1.0	12.8	-7.7
July 21	0645	O	-2.5	+1.0	0.25	+0.25	-2.8
July 25	1205	H	-7.5	13.0	0.75	9.8	+2.2
July 29	1020	C	-9.0	11.8	1.0	11.8	+2.8
Aug 2	0955	O	-2.5	11.5	0.25	2.9	+0.4
Aug 6	0720	CL	-5.0	1.0	0.5	0.5	-4.5
Aug 10	1005	O	-6.0	11.5	0.25	2.9	-3.1
Aug 14	1020	O	-5.0	11.8	0.25	2.9	-2.1
Aug 18	1130	C	-10.0	12.0	1.0	12.0	+2.0
Aug 22	0700	CL	-2.0	0.0	0.5	0.0	-2.0
Arctostaphylos uva-ursi - Plot 2							
May 10	1025	C	-12.0	12.0	1.0	12.0	0
May 14	1430	C	-10.5	10.0	1.0	10.0	-0.5
May 18	1045	C	-5.5	12.3	1.0	12.3	+6.8
May 22	0845	C	-11.0	7.4	1.0	7.4	-3.6
May 26	1150	CL	-13.0	12.9	0.5	6.4	-6.6
May 30	1255	CL	-28.0	12.7	0.5	6.4	-21.6
June 3	0825	C	-23.0	6.3	1.0	6.3	-16.3
June 7	1155	C	-27.0	12.0	1.0	13.0	-14.0
June 11	0850	C	-19.5	3.0	1.0	3.0	-16.5
June 15	1235	C	-23.0	12.9	1.0	12.9	-10.1
June 19	1150	S	-26.0	12.9	0.75	9.7	-16.3
June 23	1110	C	-24.0	1.0	1.0	12.6	-11.4
June 27	1130	CL	-27.0	12.8	0.5	6.4	-20.6
July 1	1120	O	-6.5	12.6	0.25	3.2	-3.3
July 5	0710	O	-1.0	1.0	0.25	0.3	-0.7
July 9	1210	C	-19.0	12.9	1.0	12.9	-6.1
July 13	1110	C	-18.0	12.6	1.0	12.6	-5.3
July 17	1220	PC	-23.5	12.9	0.75	9.7	-13.8
July 21	0750	O	-5.5	3.0	0.25	0.8	-4.7
July 25	0720	H	-1.5	1.0	0.75	0.8	-0.7
July 29	1000	C	-20.0	11.5	1.0	11.5	-8.5
Aug 2	1040	O	-3.0	12.3	0.25	3.1	+0.1
Aug 6	0830	CL	-8.0	6.3	0.5	3.1	-4.9
Aug 10	1050	O	-8.5	12.3	0.25	3.1	-5.4
Aug 14	1000	O	-6.0	11.5	0.25	2.9	-3.1
Aug 18	1000	C	-15.0	11.5	1.0	11.5	-3.5
Aug 22	0720	CL	-1.5	1.0	0.5	0.5	-1.0

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
Cornus canadensis - Plot 3							
May 14	1300	C	-10.0	8.7	1.0	8.7	-1.3
May 18	0935	C	-9.0	5.1	1.0	5.1	-3.9
May 22	1220	PC	-14.0	8.5	0.75	6.4	-7.6
May 26	0715	C	-2.5	0.5	1.0	0.5	-2.0
May 30	1035	C	-22.0	6.9	1.0	6.9	-15.1
June 3	0915	C	-6.0	4.7	1.0	4.7	-1.3
June 7	1225	C	-17.0	8.6	1.0	8.6	-8.4
June 11	0940	C	-11.0	5.6	1.0	5.6	-5.4
June 15	1130	C	-12.5	8.1	1.0	8.1	-4.4
June 19	1030	C	-14.0	6.9	1.0	6.9	-7.1
June 23	0805	S	-8.0	0.0	0.75	0.0	-8.0
June 27	1015	CL	-14.5	6.4	0.5	3.2	-11.3
July 1	0940	O	-2.5	5.6	0.25	1.4	-1.1
July 5	1045	O	-4.5	-7.3	0.25	1.8	-2.7
July 9	0710	C	-4.5	0.5	1.0	0.5	-4.0
July 13	0945	C	-13.5	5.6	1.0	5.6	-7.9
July 17	1105	C	-8.5	7.7	1.0	7.7	-0.8
July 21	0850	O	-6.0	3.7	0.25	0.9	-5.1
July 25	0820	H	-3.0	2.6	0.75	1.9	-1.1
July 29	0915	C	-9.0	4.7	1.0	4.7	-4.3
Aug 2	0925	O	-2.0	5.1	0.25	1.3	-0.7
Aug 6	0940	CL	-10.5	5.6	0.5	2.8	-7.7
Aug 10	0905	O	-7.5	4.2	0.25	1.1	-6.4
Aug 14	0915	O	-5.0	4.7	0.25	1.2	-3.8
Aug 18	0910	C	-5.0	4.7	1.0	4.7	-0.3
Aug 22	0815.	CL	-3.5	2.6	0.5	1.3	-2.2
Cornus canadensis - Plot 4							
May 14	1140	C	-6.5	8.2	1.0	8.2	+1.7
May 18	0825	C	-8.0	3.1	1.0	3.1	-4.9
May 22	1055	C	-19.5	7.7	1.0	7.7	-11.8
May 26	1045	CL	-5.0	7.3	0.5	3.6	-1.4
May 30	0940	C	-16.5	5.6	1.0	5.6	-10.9
June 3	1040	C	-19.0	7.3	1.0	7.3	-11.7
June 7	0730	C	-11.0	1.0	1.0	1.0	-10.0
June 11	1020	C	-8.0	6.9	1.0	6.9	-1.1
June 15	0945	C	-11.5	5.6	1.0	5.6	-5.9
June 19	0830	S	-8.5	3.1	0.75	2.3	-6.2
June 23	0825	PC	-8.0	3.1	0.75	2.3	-5.7
June 27	0830	CL	-6.5	3.1	0.5	1.6	-4.9
July 1	0855	O	-3.5	4.2	0.25	1.1	-2.4
July 5	0920	O	-1.5	4.7	0.25	1.2	-0.3
July 9	0815	C	-4.5	2.6	1.0	2.6	-1.9
July 13	0715	C	-7.5	0.5	1.0	0.5	-7.0
July 17	0720	F	-10.0	0.5	0.75	0.4	-9.6
July 21	1030	O	-8.0	6.9	0.25	1.7	-6.3
July 25	0900	H	-4.5	-4.2	0.75	3.2	-1.3
July 29	0800	C	-4.0	2.0	1.0	2.0	-2.0

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
Aug 2	0820	O	-0.0	2.6	0.25	+0.6	+0.6
Aug 6	1030	O	-13.0	6.9	0.25	1.7	-11.3
Aug 10	0805	CL	5.0	2.0	0.5	0.5	-4.5
Aug 14	0720	O	-4.0	0.5	0.25	0.1	-3.9
Aug 18	0805	C	-4.0	2.0	1.0	2.0	-2.0
Aug 22	0905	CL	-2.5	4.2	0.5	2.1	-0.4
Cornus canadensis - Plot 5							
May 14	0945	C	-7.5	5.6	1.0	5.6	-1.9
May 18	0735	C	-4.5	1.0	1.0	1.0	-3.5
May 22	0930	C	-15.0	5.1	1.0	5.1	-9.9
May 26	0915	C	-2.0	4.7	1.0	4.7	+4.7
May 30	0800	C	-7.5	2.0	1.0	2.0	-5.5
June 3	1130	C	-20.0	8.1	1.0	8.1	-11.9
June 7	0830	C	-17.0	3.1	1.0	3.1	-13.9
June 11	1130	C	-15.0	8.1	1.0	8.1	-6.9
June 15	0755	C	-8.5	2.0	1.0	2.0	-6.5
June 19	0710	CL	-6.5	0.5	0.5	0.3	-6.2
June 23	0955	PC	-8.0	6.0	0.75	4.5	-3.5
June 27	0715	CL	-4.5	0.5	0.5	0.3	-4.2
July 1	0700	O	-1.5	0.0	0.25	0.0	-1.5
July 5	0755	O	-2.0	2.0	0.25	0.5	-1.5
July 9	0910	C	-11.0	4.7	1.0	4.7	-6.3
July 13	0810	C	-8.5	2.6	1.0	2.6	-5.9
July 17	0845	C	-7.5	3.7	1.0	3.7	-3.8
July 21	0940	O	-4.0	5.6	0.25	1.4	-2.6
July 25	1015	H	-18.5	6.4	0.75	4.8	-13.7
July 29	0650	C	-2.5	+0.5	1.0	+0.5	-3.0
Aug 2	0650	O	0.0	+0.5	0.25	-0.1	+0.1
Aug 6	1210	C	-18.5	8.5	1.0	8.5	-10.0
Aug 10	0710	O	-11.5	0.5	0.25	0.2	-11.3
Aug 14	0750	O	-6.5	1.5	0.25	0.4	-6.1
Aug 18	0700	C	-4.0	0.0	1.0	0.0	-4.0
Aug 22	1000	PC	-16.5	6.0	0.75	4.5	-12.0
Cornus canadensis - Plot 6							
May 14	1020	C	-5.5	6.4	1.0	6.4	+0.9
May 18	0710	C	-4.5	0.5	1.0	0.5	-4.0
May 22	1000	C	-15.0	5.0	1.0	6.0	-9.0
May 26	0955	C	-1.5	6.0	1.0	6.0	+4.5
May 30	0835	C	-12.0	3.1	1.0	3.1	-8.9
June 3	1205	C	-13.5	8.4	1.0	8.4	-5.1
June 7	0900	C	-12.5	4.2	1.0	4.2	-8.3
June 11	1205	CL	-15.0	8.4	0.5	4.2	-10.8
June 15	0920	C	-8.5	2.6	1.0	2.6	-5.9
June 19	0645	CL	-7.0	+0.5	0.5	+0.3	-6.7
June 23	0935	PC	-15.0	5.1	0.75	3.8	-11.2
June 27	0750	CL	-6.0	1.5	0.5	0.8	-5.2
July 1	0745	O	-3.5	1.5	0.25	0.4	-3.1
July 5	0815	O	-1.5	2.6	0.25	0.6	-0.9

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
July 9	0940	C	-4.5	5.6	1.0	5.6	+1.1
July 13	0735	C	-7.5	1.5	1.0	1.5	-6.0
July 17	0810	C	-4.0	2.6	1.0	2.6	-1.4
July 21	0925	CL	-3.5	5.1	0.5	2.6	-0.9
July 25	1035	H	-20.5	6.9	0.75	5.1	-15.4
July 29	0710	C	-2.5	0.5	1.0	0.5	-2.0
Aug 2	0705	O	-1.5	0	0.25	0	-1.5
Aug 6	1145	CL	-7.0	8.2	0.5	4.1	-2.9
Aug 10	0650	H	-7.0	-0.5	0.75	+0.4	-7.4
Aug 14	0805	O	-7.0	2.0	0.25	0.5	-6.5
Aug 18	0710	C	-5.0	0.5	1.0	0.5	-4.5
Aug 22	1015	PC	-11.0	6.4	0.75	4.8	-6.2
Cornus canadensis - Plot 9							
May 14	1330	C	-6.0	8.5	1.0	8.5	+2.5
May 18	0950	C	-5.0	5.6	1.0	5.6	+0.6
May 22	1240	PC	-16.5	8.6	0.75	6.5	-10.0
May 26	0740	C	-2.0	1.5	1.0	1.5	-0.5
May 30	1130	C	-23.0	8.1	1.0	8.1	-14.9
June 3	0950	C	-32.5	5.6	1.0	5.6	-26.9
June 7	1300	CL	-8.0	8.7	0.5	4.4	-3.6
June 11	0905	C	-5.0	4.2	1.0	4.2	-0.8
June 15	1050	C	-10.0	-7.3	1.0	7.3	-2.7
June 19	1010	C	-13.5	6.4	1.0	6.4	-7.1
June 23	0720	S	-7.0	0.5	0.75	0.4	-6.6
June 27	0935	CL	-15.0	5.1	0.5	2.6	-12.4
July 1	1000	O	-3.5	6.0	0.25	1.5	-2.0
July 5	1035	O	-4.0	6.9	0.25	1.7	-2.3
July 9	0630	C	-5.0	+0.5	1.0	+0.5	-5.5
July 13	0915	C	-14.5	4.7	1.0	4.7	-9.8
July 17	1035	C	-13.5	6.9	1.0	6.9	-6.6
July 21	0825	O	-2.5	3.1	0.25	0.8	-1.7
July 25	0750	H	-6.5	1.5	0.75	1.1	-5.4
July 29	0845	C	-14.0	3.7	1.0	3.7	-10.3
Aug 2	0905	O	-4.0	4.2	0.25	1.1	-2.9
Aug 6	0900	PC	-15.5	4.2	0.5	2.1	-13.4
Aug 10	0850	O	-9.5	3.7	0.25	0.9	-8.6
Aug 14	0900	O	-7.0	4.2	0.25	1.1	-5.9
Aug 18	0850	C	-9.5	3.7	1.0	3.7	-5.8
Aug 22	0800	C	-1.0	2.0	1.0	2.0	+1.0
Cornus canadensis - Plot 10							
May 14	1400	C	-18.0	8.4	1.0	8.4	-9.6
May 18	1020	C	-6.5	6.4	1.0	6.4	-0.1
May 22	0815	C	-8.0	2.6	1.0	2.6	-5.6
May 26	1115	CL	-10.5	7.9	0.5	3.9	-6.6
May 30	1230	CL	-15.0	8.6	0.5	4.3	-10.7
June 3	0810	C	-3.5	2.6	1.0	2.6	-0.9
June 7	1120	C	-24.0	7.9	1.0	7.9	-16.1
June 11	0815	C	-5.0	2.6	1.0	2.6	-2.4

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
June 15	1310	C	-10.5	8.7	1.0	8.7	-1.8
June 19	1100	C	-7.5	7.7	1.0	7.7	+0.2
June 23	1130	C	-7.5	8.1	1.0	8.1	-0.6
June 27	1045	CL	-9.0	7.3	0.5	3.6	-5.4
July 1	1050	O	-2.0	7.3	0.25	1.8	-0.2
July 5	0640	O	-0.0	+0.5	0.25	+0.1	-0.1
July 9	1120	C	-12.5	7.9	1.0	7.9	-4.6
July 13	1145	PC	-9.5	8.2	0.75	6.2	-3.3
July 17	1140	C	-6.5	8.2	1.0	8.2	+1.7
July 21	0710	O	-4.0	0.5	0.25	0.1	-3.9
July 25	0640	H	-2.0	+0.5	0.75	+0.4	-2.4
July 29	0940	C	-8.0	5.6	1.0	5.6	-2.4
Aug 2	1015	O	-1.0	6.4	0.25	1.6	+0.6
Aug 6	0750	CL	-4.5	1.5	0.5	0.8	-3.7
Aug 10	1025	O	-9.0	6.9	0.25	1.7	-7.3
Aug 14	0940	O	-6.0	5.6	0.25	1.4	-4.6
Aug 18	0930	C	-10.0	5.1	1.0	5.1	-4.9
Aug 22	0740	O	-1.0	1.5	0.25	0.4	-0.6
Cornus canadensis - Plot 11							
June 19	0755	CL	-4.0	2.0	0.5	1.0	-3.0
June 23	0900	PC	-10.0	4.2	0.75	3.2	-6.8
June 27	1100	CL	-3.5	7.7	0.5	3.9	+0.4
July 1	0825	O	-2.5	3.1	0.25	0.8	-1.7
July 5	0900	O	-1.5	4.2	0.25	1.1	-0.4
July 9	1050	C	-10.0	7.3	1.0	7.3	-2.7
July 13	0840	C	-6.5	3.7	1.0	3.7	-2.8
July 17	0925	C	-7.5	5.1	1.0	5.1	-2.4
July 21	0905	H	-5.0	4.2	0.5	2.1	-2.9
July 25	0950	C	-11.5	5.6	1.0	5.6	-5.9
July 29	0740	C	-2.5	1.5	1.0	1.5	-1.0
Aug 2	0740	O	-1.5	1.5	0.25	0.4	-1.1
Aug 6	1125	CL	-14.0	8.1	0.5	4.0	-10.0
Aug 10	0740	O	-9.0	1.5	0.25	0.4	-8.6
Aug 14	0835	O	-7.5	3.1	0.25	0.8	-6.7
Aug 18	0740	C	-5.5	1.5	1.0	1.5	-4.0
Aug 22	0935	PC	-7.0	5.1	0.75	3.8	-3.2
Larix laricina - Plot 7							
May 26	1240	CL	-12.5	17.1	0.5	8.6	-3.9
May 30	0655	C	-14.0	0.0	1.0	0.0	-14.0
June 3	1350	C	-19.0	14.5	1.0	14.5	-4.5
June 7	1010	C	-16.0	15.1	1.0	15.1	-0.9
June 11	0650	C	-14.0	+1.0	1.0	+1.0	-15.0
June 15	0700	C	-15.5	0.0	1.0	0.0	-15.5
June 19	1245	C	-22.0	17.1	1.0	17.1	-4.9
June 23	1235	PC	-21.0	16.3	0.75	12.2	-8.8
June 27	1235	O	-21.0	16.3	0.25	4.1	-16.9
July 1	1230	O	-13.5	16.3	0.25	4.1	-9.4
July 5	1200	PC	-14.0	14.5	0.75	10.9	-3.1

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
July 9	1315	C	-18.0	17.0	1.0	17.0	-1.0
July 13	1015	C	-21.0	15.1	1.0	15.1	-5.9
July 17	0640	C	-5.0	+1.5	1.0	+1.5	-6.5
July 21	0625	CL	-6.5	+2.5	0.5	+1.3	-7.8
July 25	1240	PC	-20.5	17.1	0.75	12.8	-7.7
July 29	1045	C	-21.5	16.4	1.0	16.4	-5.1
Aug 2	1100	O	-4.0	17.0	0.25	4.3	+0.3
Aug 6	0700	O	-7.5	0.0	0.25	0.0	-7.5
Aug 10	0930	O	-13.0	13.3	0.25	3.3	-9.7
Aug 14	1040	O	-13.0	16.4	0.25	4.1	-8.9
Aug 18	1045	C	16.0	16.4	1.0	16.4	+0.4
Aug 22	1100	C	14.0	17.0	1.0	17.0	+3.0
Ledum groenlandicum - Plot 7							
May 10	1115	C	-8.0	9.6	1.0	9.6	+1.6
May 14	0830	C	-6.0	3.5	1.0	3.5	-2.5
May 18	1125	C	-3.5	9.9	1.0	9.9	+6.4
May 22	1320	PC	-13.0	9.4	0.75	7.1	-5.9
May 26	1240	CL	-9.0	10.0	0.5	5.0	-4.0
May 30	0655	C	-2.5	0.0	1.0	0.0	-2.5
June 3	1350	C	-19.0	9.2	1.0	9.2	-9.8
June 7	1010	C	-18.0	8.6	1.0	8.6	-9.4
June 11	0650	C	-5.0	+0.3	1.0	+0.3	-5.3
June 15	0700	C	-6.0	0.0	1.0	0.0	-6.0
June 19	1245	C	-23.0	10.0	1.0	10.0	-13.0
June 23	1235	PC	-16.0	10.2	0.75	7.6	-8.4
June 27	1235	O	-7.0	10.2	0.25	2.5	-4.5
July 1	1230	O	-7.0	10.2	0.25	2.5	-4.5
July 5	1200	PC	-9.0	10.5	0.75	7.9	-1.1
July 9	1315	C	-9.5	-9.6	1.0	9.6	+0.1
July 13	1015	C	-10.5	8.6	1.0	8.6	-1.9
July 17	0640	C	-3.5	+0.8	1.0	+0.8	-4.3
July 21	0625	CL	2.0	+1.2	0.5	+0.6	-2.6
July 25	1240	PC	-8.0	10.0	0.75	7.5	-0.5
July 29	1045	C	-9.0	9.1	1.0	9.1	+0.1
Aug 2	1100	O	-1.5	9.3	0.25	2.3	+0.8
Aug 6	0700	O	-2.5	0.0	0.25	0.0	-2.5
Aug 10	0930	O	-3.5	6.4	0.25	1.6	-1.9
Aug 14	1040	O	-4.5	9.1	0.25	2.3	-2.2
Aug 18	1045	C	-6.5	9.1	1.0	9.1	+2.6
Aug 22	1100	C	-2.0	9.3	1.0	9.3	+7.3
Ledum groenlandicum - Plot 8							
May 10	0850	C	-2.5	4.0	1.0	4.0	+1.5
May 14	1225	C	-8.0	10.2	1.0	10.2	+2.2
May 18	0905	C	-6.5	4.5	1.0	4.5	-2.0
May 22	1125	C	-16.5	9.9	1.0	9.9	-6.6
May 26	0835	C	-3.0	3.5	1.0	3.5	+0.5
May 30	1015	C	-8.0	8.6	1.0	8.6	+0.6
June 3	1320	C	-10.5	9.6	1.0	9.6	-0.9

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
June 7	0655	C	-5.0	0.0	1.0	0.0	-5.0
June 11	1005	C	-19.5	8.3	1.0	8.3	-11.2
June 15	1015	C	-13.5	8.6	1.0	8.6	-4.9
June 19	0855	S	-13.0	4.5	0.75	3.4	-9.6
June 23	0800	S	-7.0	2.5	0.75	1.9	-5.1
June 27	0905	CL	7.5	4.5	0.5	2.3	-5.2
July 1	1200	O	-5.5	9.8	0.25	2.5	-3.0
July 5	0955	O	-2.0	8.3	0.25	2.1	+0.1
July 9	0745	C	-3.0	1.9	1.0	1.9	-1.1
July 13	0645	C	-3.0	+0.6	1.0	+0.6	-3.6
July 17	1000	C	-8.5	8.3	1.0	8.3	-0.2
July 21	1100	O	-5.5	9.3	0.25	2.3	-3.2
July 25	1145	H	-10.5	10.2	0.75	7.7	-2.8
July 29	0825	C	-3.0	3.5	1.0	3.5	+0.5
Aug 2	0845	O	-1.5	4.0	0.25	1.0	-0.5
Aug 6	1000	O	-6.0	8.3	0.25	2.1	-3.9
Aug 10	0830	O	-5.5	3.5	0.25	0.9	-4.6
Aug 14	0700	O	-5.5	0.0	0.25	0.0	-5.5
Aug 18	0830	C	-2.5	3.5	1.0	3.5	+1.0
Aug 22	0840	CL	-2.5	4.0	0.5	2.0	-0.5
Linnaea borealis - Plot 4							
May 14	1140	C	-15.0	7.9	1.0	7.9	-7.1
May 18	0825	C	-10.5	3.0	1.0	3.0	-7.5
May 22	1055	C	-13.5	7.4	1.0	7.4	-6.1
May 26	1045	CL	-10.5	7.0	0.5	3.5	-7.0
May 30	0940	C	-9.5	5.0	1.0	5.0	-4.5
June 3	1040	C	-13.0	7.0	1.0	7.0	-6.0
June 7	0830	C	-8.0	1.4	1.0	1.4	-6.6
June 11	1030	C	-12.0	6.5	1.0	6.5	-5.5
June 15	0945	C	-12.5	5.0	1.0	5.0	-7.5
June 19	0830	S	-13.0	3.0	0.75	2.2	-10.8
June 23	0825	PC	-19.0	3.0	0.75	2.2	-16.8
June 27	0830	CL	-13.0	3.0	0.5	1.5	-11.5
July 1	0855	O	-6.5	3.1	0.25	0.8	-5.7
July 5	0920	O	-1.5	3.7	0.25	0.9	-0.6
July 9	0815	C	-5.5	2.9	1.0	2.9	-2.6
July 13	0715	C	-7.5	0.7	1.0	0.7	-6.8
July 17	0720	F	-8.5	0.7	0.75	0.5	-8.0
July 21	1030	O	-7.0	6.5	0.25	1.6	-5.4
July 25	0900	H	-3.5	3.1	0.75	2.3	-1.2
July 29	0800	C	-4.0	2.8	1.0	2.8	-1.2
Aug 2	0820	O	-3.5	2.9	0.25	0.7	-2.8
Aug 6	1030	O	-9.0	6.5	0.25	1.6	-7.4
Aug 10	0805	O	-6.5	2.8	0.25	0.7	-5.8
Aug 14	0720	O	-5.5	0.7	0.25	0.2	-5.3
Aug 18	0805	C	-8.0	2.8	1.0	2.8	-5.2
Aug 22	0905	CL	-4.0	3.1	0.5	1.6	-2.4

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
Linnaea borealis - Plot 5							
May 14	0945	C	-10.5	5.0	1.0	5.0	-5.5
May 18	0735	C	-6.5	1.4	1.0	1.4	-5.1
May 22	0930	C	-15.0	4.4	1.0	4.4	-10.6
May 26	0915	C	-7.5	3.7	1.0	3.7	-3.8
May 30	0800	C	-6.5	2.8	1.0	2.8	-3.7
June 3	1130	C	-15.5	7.7	1.0	7.7	-7.8
June 7	0830	C	-8.5	3.0	1.0	3.0	-5.5
June 11	1130	C	-15.5	7.7	1.0	7.7	-7.8
June 15	0755	C	-10.0	2.8	1.0	2.8	-7.2
June 19	0710	CL	-9.0	0.7	0.5	0.4	-8.6
June 23	0955	PC	-12.5	5.6	0.75	4.2	-8.3
June 27	0715	CL	-9.0	0.7	0.5	0.4	-8.6
July 1	0700	O	-3.5	0.0	0.25	0.0	-3.5
July 5	0755	O	0.0	2.8	0.25	0.7	+0.7
July 9	0910	C	-5.0	3.7	1.0	3.7	-1.3
July 13	0810	C	-5.0	2.9	1.0	2.9	-2.1
July 17	0845	C	-8.0	3.0	1.0	3.0	-5.0
July 21	0940	O	-5.0	5.0	0.25	1.2	-3.8
July 25	1015	H	-11.0	6.1	0.75	4.5	-6.5
July 29	0650	C	-3.0	+0.3	1.0	+0.3	-3.3
Aug 2	0650	O	-4.5	+0.3	0.25	+0.1	-4.6
Aug 6	1210	C	-8.0	7.9	1.0	7.9	-0.1
Aug 10	0710	O	-3.5	0.7	0.25	0.2	-3.3
Aug 14	0750	O	-6.0	2.1	0.25	0.5	-5.5
Aug 18	0700	C	-3.5	0.0	1.0	0.0	-3.5
Aug 22	1000	PC	-10.0	5.6	0.75	4.2	-5.8
Linnaea borealis - Plot 6							
May 14	1020	C	-10.0	6.1	1.0	6.1	-4.0
May 18	0710	C	-4.0	0.7	1.0	0.7	-3.3
May 22	1000	C	-13.0	5.6	1.0	5.6	-7.4
May 26	0955	C	-1.5	5.6	1.0	5.6	+4.1
May 30	0855	C	-12.5	3.0	1.0	3.0	-9.5
June 3	1205	C	-15.0	8.0	1.0	8.0	-7.0
June 7	0900	C	-13.5	3.1	1.0	3.1	-10.4
June 11	1205	CL	-13.0	8.0	0.5	4.0	-9.0
June 15	0820	C	-14.0	2.9	1.0	2.9	-11.1
June 19	0645	CL	-16.5	+0.7	0.5	+0.4	-16.9
June 23	0935	PC	-14.5	4.4	0.75	3.3	-11.2
June 27	0750	CL	-12.0	2.1	0.5	1.1	-10.9
July 1	0745	O	-5.0	2.1	0.25	0.5	-4.5
July 5	0815	O	-1.5	2.9	0.25	0.7	-0.8
July 9	0940	C	-7.5	5.0	1.0	5.0	-2.5
July 13	0745	C	-8.5	2.1	1.0	2.1	-6.4
July 17	0810	C	-6.5	2.9	1.0	2.9	-3.6
July 21	0925	O	-6.5	4.4	0.25	1.1	-5.4
July 25	1035	H	-10.5	6.5	0.75	4.9	-5.6
July 29	0710	C	-4.0	0.7	1.0	0.7	-3.3

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
Aug 2	0705	O	-9.5	0.0	0.25	0.0	-9.5
Aug 6	1145	CL	-10.5	-7.9	0.5	4.0	-6.5
Aug 10	0650	H	-8.0	+0.3	0.75	+0.2	-8.2
Aug 14	0805	O	-5.5	-2.8	0.25	0.7	-4.8
Aug 18	0710	C	-5.0	0.7	1.0	0.7	-4.3
Aug 22	1015	PC	-4.0	6.1	0.75	4.5	+0.5
Linnaea borealis - Plot 9							
May 14	1330	C	-6.0	7.1	1.0	7.1	+1.1
May 18	0950	C	-5.5	5.0	1.0	5.0	-0.5
May 22	1240	PC	-16.5	7.6	0.75	5.7	-10.8
May 26	0740	C	-4.0	2.1	1.0	2.1	-1.9
May 30	1120	C	-17.5	7.7	1.0	7.7	-9.8
June 3	0950	C	-11.5	5.0	1.0	5.0	-6.5
June 7	1300	CL	-14.0	7.4	0.5	3.7	-10.3
June 11	0905	C	-11.0	3.1	1.0	3.1	-7.9
June 15	1050	C	-13.0	7.0	1.0	7.0	-6.0
June 19	1010	C	-16.0	6.1	1.0	6.1	-10.9
June 23	0720	S	-16.0	0.7	0.75	0.5	-15.5
June 27	0935	CL	-21.0	4.4	0.5	2.2	-18.8
July 1	1000	O	-7.5	5.6	0.25	1.4	-6.1
July 5	1035	O	-2.0	6.5	0.25	1.6	-0.4
July 9	0630	C	-5.5	+1.4	1.0	+1.4	-6.9
July 13	0915	C	-13.5	3.7	1.0	3.7	-9.8
July 17	1035	C	-15.0	6.5	1.0	6.5	-8.5
July 21	0825	O	-4.5	3.0	0.25	0.7	-3.8
July 25	0750	H	-5.5	2.1	0.75	1.6	-3.9
July 29	0845	C	-8.5	3.0	1.0	3.0	-5.5
Aug 2	0905	O	-2.0	3.1	0.25	0.8	-1.2
Aug 6	0900	CL	-10.0	3.1	0.5	1.6	-8.4
Aug 10	0850	O	-5.5	3.0	0.25	0.8	-4.7
Aug 14	0900	O	-5.0	3.1	0.25	0.8	-4.2
Aug 18	0850	C	-6.0	3.0	1.0	3.0	-3.0
Aug 22	0800	C	-1.0	2.8	1.0	2.8	+1.8
Linnaea borealis - Plot 10							
May 14	1400	C	-19.0	6.8	1.0	6.8	-12.2
May 18	1020	C	-8.5	6.1	1.0	6.1	-2.5
May 22	0815	C	-12.5	2.9	1.0	2.9	-9.6
May 26	1115	CL	-13.0	7.6	0.5	3.8	-9.7
May 30	1230	CL	-9.0	7.7	0.5	3.9	-5.1
June 3	0810	C	-10.0	2.9	1.0	2.9	-7.1
June 7	1120	C	-6.0	7.6	1.0	7.6	+1.6
June 11	0815	C	-12.0	2.9	1.0	2.9	-9.1
June 15	1310	C	-14.5	7.3	1.0	7.3	-7.2
June 19	1100	C	-14.0	7.4	1.0	7.4	-6.6
June 23	1130	C	-13.0	7.7	1.0	7.7	-5.3
June 27	1045	CL	-11.0	7.0	0.5	3.5	-7.5
July 1	1050	O	-6.0	7.0	0.25	1.7	-4.3
July 5	0640	O	-1.5	+0.8	0.25	+0.2	-1.7

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
July 9	1120	C	-5.5	7.6	1.0	7.6	+2.1
July 13	1145	PC	-8.5	7.9	0.75	5.9	-2.6
July 17	1140	C	-9.0	7.9	1.0	7.9	-1.1
July 21	0710	O	-5.0	0.7	0.25	0.2	-4.8
July 25	0640	H	-4.0	+0.8	0.75	+0.6	-4.6
July 29	0940	C	-5.0	5.0	1.0	5.0	-0.0
Aug 2	1015	O	-2.0	6.1	0.25	1.5	-0.5
Aug 6	0750	CL	-6.5	2.1	0.5	1.1	-5.4
Aug 10	1025	O	-6.0	6.5	0.25	1.6	-4.4
Aug 14	0940	O	-5.0	5.0	0.25	1.2	-3.8
Aug 18	0930	C	-7.5	4.4	1.0	4.4	-3.1
Aug 22	0740	O	-3.0	2.1	0.25	0.5	-2.5
Linnaea borealis - Plot 11							
June 11	1300	CL	-9.5	7.4	0.5	3.7	-5.8
June 15	0905	C	-12.5	3.1	1.0	3.1	-9.4
June 19	0755	CL	-16.5	2.8	0.5	1.4	-15.1
June 23	0900	PC	-13.0	3.1	0.75	2.3	-10.7
June 27	1100	CL	-9.0	7.4	0.5	3.7	-5.3
July 1	0825	O	-5.0	3.0	0.25	0.7	-4.3
July 5	0900	O	-2.5	3.1	0.25	0.8	-1.7
July 9	1050	C	-10.0	7.0	1.0	7.0	-3.0
July 13	0840	C	-5.0	3.0	1.0	3.0	-2.0
July 17	0925	C	-8.5	4.4	1.0	4.4	-4.1
July 21	0905	CL	-5.0	3.1	0.5	1.6	-3.4
July 25	0950	C	-9.0	5.0	1.0	5.0	-4.0
July 29	0740	C	-3.5	2.1	1.0	2.1	-1.4
Aug 2	0740	O	-2.5	2.1	0.25	0.5	-2.0
Aug 6	1125	CL	-7.5	7.7	0.5	3.9	-3.6
Aug 10	0740	O	-8.5	2.1	0.25	0.5	-8.0
Aug 14	0845	O	-6.5	2.3	0.25	0.7	-5.8
Aug 18	0740	C	-4.5	2.1	1.0	2.1	-2.4
Aug 22	0935	PC	-10.5	4.4	0.75	3.4	-7.1
Lonicera involucrata - Plot 5							
May 22	0930	C	-8.0	11.3	1.0	11.3	+3.3
May 26	0915	C	-8.0	9.4	1.0	9.4	+1.4
May 30	0800	C	-9.0	2.0	1.0	2.0	-7.0
June 3	1130	C	-13.0	16.7	1.0	16.7	+3.7
June 7	0830	C	-10.5	4.8	1.0	4.8	-5.7
June 11	1130	C	-16.5	16.7	1.0	16.7	+0.2
June 15	0755	C	-12.5	2.0	1.0	2.0	-10.5
June 19	0710	CL	-7.0	0.5	0.5	0.3	-6.7
June 23	0955	PC	-10.0	15.0	0.75	11.2	+1.3
June 27	0715	CL	-8.0	0.5	0.5	0.25	-7.7
July 1	0700	O	-3.5	0.0	0.25	0.0	-3.5
July 5	0755	O	-1.5	2.0	0.25	0.5	-1.0
July 9	0910	C	-6.5	9.4	1.0	9.4	+2.9
July 13	0810	C	-10.5	3.4	1.0	3.4	-7.1
July 17	0845	C	-7.0	6.1	1.0	6.1	-0.9

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
July 21	0940	O	-7.5	13.1	0.25	3.3	-4.2
July 25	1015	H	-9.0	15.4	0.75	11.5	+2.5
July 29	0650	C	-3.0	+0.2	1.0	+0.2	-3.2
Aug 2	0650	O	-1.0	+0.2	0.25	+0.1	-1.1
Aug 6	1210	C	-12.5	17.1	1.0	17.1	+4.6
Aug 10	0710	O	-5.5	0.5	0.25	0.1	-5.4
Aug 14	0750	O	-7.0	1.5	0.25	0.4	-6.6
Aug 18	0700	C	-4.0	0.0	1.0	0.0	-4.0
Aug 22	1000	PC	-7.5	15.0	0.75	11.3	+3.8
Lonicera involucrata - Plot 6							
May 22	1000	C	-11.0	15.0	1.0	15.0	+4.0
May 26	0955	C	-4.5	15.0	1.0	15.0	+10.5
May 30	0935	C	-10.5	4.8	1.0	4.8	-5.7
June 3	1205	C	-12.0	17.0	1.0	17.0	+5.0
June 7	0900	C	-12.5	7.5	1.0	7.5	-5.0
June 11	1205	CL	-16.0	17.0	0.5	8.5	-7.5
June 15	0820	C	-15.5	3.4	1.0	3.4	-12.1
June 19	0645	CL	-8.0	+0.5	0.5	+0.2	-8.3
June 23	0935	PC	-17.0	11.3	0.75	8.4	-8.6
June 27	0750	CL	-9.0	1.5	0.5	0.8	-8.2
July 1	0745	O	-3.5	1.5	0.25	0.4	-3.1
July 5	0815	O	-2.0	3.4	0.25	0.8	-1.2
July 9	0940	C	-14.0	13.1	1.0	13.1	-0.9
July 13	0745	C	-7.5	1.5	1.0	1.5	-6.0
July 17	0810	C	-10.0	3.4	1.0	3.4	-6.6
July 21	0925	O	-11.5	11.3	0.25	2.8	-8.7
July 25	1035	H	-16.5	15.7	0.75	11.8	-4.7
July 29	0710	C	-2.5	0.5	1.0	0.5	-2.0
Aug 2	0705	O	-2.0	0.0	0.25	0.0	-2.0
Aug 6	1145	CL	-10.5	16.9	0.5	8.4	-2.1
Aug 10	0650	H	-3.5	+0.2	0.75	+0.2	-3.7
Aug 14	0805	O	-6.0	2.0	0.25	0.5	-5.5
Aug 18	0710	C	-4.5	0.5	1.0	0.5	-4.0
Aug 22	1015	PC	-13.0	15.4	0.75	11.5	-1.5
Mitella nuda - Plot 5							
May 18	0735	C	-6.5	0.5	1.0	0.5	-6.0
May 22	0930	C	-22.0	5.0	1.0	5.0	-17.0
May 26	0915	C	-5.5	4.0	1.0	4.0	-1.5
May 30	0800	C	-7.5	1.0	1.0	1.0	-6.5
June 3	1130	C	-10.0	16.5	1.0	16.5	+6.5
June 7	0830	C	-17.0	2.0	1.0	2.0	-15.0
June 11	1130	C	-16.0	16.5	1.0	16.5	+0.5
June 15	0755	C	-12.0	1.0	1.0	1.0	-11.0
June 19	0710	CL	-9.5	0.3	0.5	0.1	-9.4
June 23	0955	PC	-12.5	7.0	0.75	5.3	-7.2
June 27	0715	CL	-5.0	0.3	0.5	0.1	-4.9
July 1	0700	O	-4.5	0.0	0.25	0.0	-4.5
July 5	0755	O	-1.5	1.0	0.25	0.3	-1.3

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
July 9	0910	C	-5.5	4.0	1.0	4.0	-1.5
July 13	0810	C	-5.0	1.5	1.0	1.5	-3.5
July 17	0845	C	-5.0	2.5	1.0	2.5	-2.5
July 21	0940	O	-5.5	6.0	0.25	1.5	-4.0
July 25	1015	H	-11.5	9.1	0.75	6.8	-4.7
July 29	0650	C	-1.5	+0.2	1.0	+0.2	-1.7
Aug 2	0650	O	-1.5	+0.2	0.25	+0.1	-1.4
Aug 6	1210	C	-17.5	17.1	1.0	17.1	-0.4
Aug 10	0710	O	-4.5	0.3	0.25	0.1	-4.4
Aug 14	0750	O	-9.5	0.8	0.25	0.2	+9.3
Aug 18	0700	C	-2.0	0.0	1.0	0.0	-2.0
Aug 22	1000	PC	-4.5	7.0	0.75	5.3	+0.8
Mitella nuda - Plot 6							
May 18	0710	C	-7.5	0.3	1.0	0.3	-7.2
May 22	1000	C	-7.0	7.0	1.0	7.0	0.0
May 26	0955	C	-3.5	7.0	1.0	7.0	+3.5
May 30	0835	C	-16.5	2.0	1.0	2.0	-14.5
June 3	1205	C	-16.0	17.5	1.0	17.5	+1.5
June 7	0900	C	-15.5	3.0	1.0	3.0	-12.5
June 11	1205	CL	-17.5	17.5	0.5	8.8	-8.7
June 15	0820	C	-13.5	1.5	1.0	1.5	-12.0
June 19	0645	CL	-11.0	+0.3	0.5	+0.1	-11.1
June 23	0935	PC	-14.5	5.0	0.75	3.8	-10.7
June 27	0750	CL	-8.5	0.75	0.5	0.4	-8.1
July 1	0745	O	-2.5	0.8	0.25	0.2	-2.3
July 5	0815	O	-1.5	0.25	0.25	0.4	-2.1
July 9	0940	C	-8.0	6.0	1.0	6.0	-2.0
July 13	0745	C	-4.5	0.8	1.0	0.8	-3.7
July 17	0810	C	-9.0	1.5	1.0	1.5	-7.5
July 21	0925	O	-5.5	5.0	0.25	1.3	-4.2
July 25	1035	H	-18.0	11.3	0.75	8.4	-9.6
July 29	0710	C	-5.0	0.3	1.0	0.3	-4.7
Aug 2	0705	O	-2.0	0.0	0.25	0.0	-2.0
Aug 6	1145	CL	-6.5	17.0	0.5	8.5	+2.0
Aug 10	0650	H	-3.0	+0.2	0.75	+0.2	-3.2
Aug 14	0805	O	-4.0	1.0	0.25	0.3	-3.7
Aug 18	0710	C	-5.0	0.3	1.0	0.3	-4.7
Aug 22	1015	PC	-6.5	9.1	0.75	6.8	+0.3
Pinus banksiana - Plot 1							
May 10	1045	C	-2.5	3.6	1.0	3.6	+1.1
May 18	1105	C	-6.0	4.0	1.0	4.0	-2.0
May 22	0745	C	-5.0	0.3	1.0	0.3	-4.7
May 26	1210	CL	-3.0	5.8	0.5	2.9	-0.1
May 30	1330	CL	-3.0	6.0	0.5	3.0	0.0
June 3	0735	C	-4.0	0.2	1.0	0.2	-3.8
June 7	1100	C	-9.5	4.0	1.0	4.0	-5.5
June 11	0720	C	-5.0	0.1	1.0	0.1	-4.9
June 15	1200	C	-12.0	5.6	1.0	5.6	-6.4

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
June 19	0920	S	-15.0	1.5	0.75	1.1	-13.9
June 23	1205	PC	-15.0	5.6	0.75	4.2	-10.8
June 27	1200	C	-16.0	5.6	0.25	1.4	-14.6
July 1	1200	PC	-10.0	5.6	0.75	4.2	-5.8
July 5	1125	CL	-8.0	4.8	0.5	2.4	-5.6
July 9	1230	C	-12.0	6.0	1.0	6.0	-6.0
July 13	1045	C	-14.0	3.6	1.0	3.6	-10.4
July 17	1245	PC	-14.5	6.2	0.75	4.7	-9.8
July 21	0645	O	-6.5	+0.1	0.25	0.0	-6.5
July 25	1205	H	-12.0	5.6	0.75	4.2	-7.8
July 29	1020	C	-13.0	2.8	1.0	2.8	-10.2
Aug 2	0955	O	-4.0	2.4	0.25	0.6	-3.4
Aug 6	0720	CL	-2.0	0.1	0.5	0.1	-1.9
Aug 10	1005	O	-9.0	2.4	0.25	0.6	-8.4
Aug 14	1020	O	-8.5	2.8	0.25	0.7	-7.8
Aug 18	1030	C	-11.0	3.2	1.0	3.2	-7.8
Aug 22	0700	CL	-7.0	0.0	0.5	0.0	-7.0
Pinus banksiana - Plot 2							
May 10	1025	C	-1.5	3.2	1.0	3.2	+1.7
May 14	1430	C	-7.0	5.2	1.0	5.2	-1.8
May 18	1045	C	-7.0	3.6	1.0	3.6	-3.4
May 22	0845	C	-2.5	1.0	1.0	1.0	-1.5
May 26	1150	CL	-2.0	5.2	0.5	2.6	+0.6
May 30	1255	CL	-2.0	6.4	0.5	3.2	+1.2
June 3	0825	C	-12.5	0.8	1.0	0.8	-11.7
June 7	1155	C	-13.5	5.6	1.0	5.6	-7.9
June 11	0750	C	-3.0	0.3	1.0	0.3	-2.7
June 15	1235	C	-17.5	6.0	1.0	6.0	-11.5
June 19	1150	PC	-16.0	5.2	0.75	3.9	-12.1
June 23	1110	C	-12.5	4.4	1.0	4.4	-8.1
June 27	1130	CL	-17.0	4.8	0.5	2.4	-14.6
July 1	1120	O	-7.0	4.4	0.25	1.1	-5.9
July 5	0710	O	-4.5	0.1	0.25	0.0	-4.5
July 9	1210	C	-14.0	5.8	1.0	5.8	-8.2
July 13	1110	C	-12.5	4.4	1.0	4.4	-8.1
July 17	1220	PC	-15.5	5.8	0.75	4.4	-11.1
July 21	0750	O	-7.5	0.3	0.25	0.1	-7.4
July 25	0720	H	-6.0	0.1	0.75	0.1	-5.9
July 29	1000	C	-13.5	2.4	1.0	2.4	-11.1
Aug 2	1040	O	-5.0	3.6	0.25	0.9	-4.1
Aug 6	0830	O	-8.5	0.8	0.25	0.2	-8.3
Aug 10	1050	O	-8.0	3.6	0.25	0.9	-7.1
Aug 14	1000	O	-7.0	2.4	0.25	0.6	-6.4
Aug 18	1000	C	-12.5	2.4	1.0	2.4	-10.1
Aug 22	0720	O	-6.0	0.1	0.25	0.0	-6.0
Pinus banksiana - Plot 3							
May 10	0915	C	-5.0	3.5	1.0	3.5	-1.5
May 30	1035	C	-4.5	5.8	1.0	5.8	+1.3

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
June 3	0915	C	-13.0	4.0	1.0	4.0	-9.0
June 7	1225	C	-12.0	4.3	1.0	4.3	-7.7
June 11	0940	C	-14.0	5.0	1.0	5.0	-9.0
June 15	1130	C	-12.5	5.8	1.0	5.8	-6.7
June 19	1030	C	-14.0	5.8	1.0	5.8	-8.7
June 23	0705	S	-10.0	0.0	0.75	0.0	-10.0
June 27	1015	CL	-13.5	5.6	0.5	2.8	-10.7
July 1	0940	O	-6.5	5.0	0.25	1.3	-5.2
July 5	1045	O	-6.0	5.9	0.25	1.5	-4.5
July 9	0710	C	-7.0	0.4	1.0	0.4	-6.6
July 13	0945	C	-13.0	5.0	1.0	5.0	-8.0
July 17	1105	C	-14.0	6.0	1.0	6.0	-8.0
July 21	0850	O	-9.0	3.0	0.25	0.8	-8.2
July 25	0820	H	-7.5	2.0	0.75	1.5	-6.0
July 29	0915	C	-10.5	4.0	1.0	4.0	-6.5
Aug 2	0925	O	-4.0	4.5	0.25	1.1	-2.9
Aug 6	0940	CL	-8.5	5.0	0.5	2.5	-6.0
Aug 10	0905	O	-8.0	3.5	0.25	0.9	-7.1
Aug 14	0915	O	-7.0	4.0	0.25	1.0	-6.0
Aug 18	0910	C	-12.0	4.0	1.0	4.0	-8.0
Aug 22	0815	CL	-6.5	2.0	0.5	1.0	-5.5
Picea glauca - Plot 3							
May 10	0915	C	-6.0	6.0	1.0	6.0	-0.0
May 14	1300	C	-14.0	7.7	1.0	7.7	-6.3
May 18	0935	PC	-8.0	6.5	0.75	4.9	-3.1
May 22	1220	C	-15.0	8.5	1.0	8.5	-6.5
May 26	0715	C	-5.5	0.5	1.0	0.5	-5.0
May 30	1035	C	-8.0	7.9	1.0	7.9	-0.1
June 3	0915	C	-11.5	6.0	1.0	6.0	-5.5
June 7	1225	C	-14.0	8.2	1.0	8.2	-5.8
June 11	0940	C	-12.0	8.0	1.0	8.0	-4.0
June 15	1130	C	-16.5	8.5	1.0	8.5	-8.0
June 19	1030	C	-14.0	7.9	1.0	7.9	-6.1
June 23	0705	S	-10.5	0.0	0.75	0.0	-10.5
June 27	1015	CL	-13.5	7.7	0.5	3.8	-9.7
July 1	0940	O	-5.5	7.0	0.25	1.8	-3.7
July 5	1045	O	-7.0	8.0	0.25	2.0	-5.0
July 9	0710	C	-6.0	0.5	1.0	0.5	-5.5
July 13	0945	C	-15.5	7.0	1.0	7.0	-8.5
July 17	1105	C	-14.0	8.2	1.0	8.2	-5.8
July 21	0850	O	-9.0	4.6	0.25	1.1	-7.9
July 25	0820	H	-6.5	2.7	0.75	2.0	-4.5
July 29	0915	C	-8.5	6.0	1.0	6.0	-2.5
Aug 2	0925	O	-4.5	6.5	0.25	1.6	-2.9
Aug 6	0940	CL	-10.0	8.0	0.5	4.0	-6.0
Aug 10	0905	O	-7.5	5.5	0.25	1.4	-6.1
Aug 14	0915	O	-6.0	6.0	0.25	1.5	-4.5
Aug 18	0910	C	-12.0	6.0	1.0	6.0	-6.0
Aug 22	0815	CL	-4.5	2.7	0.5	1.4	-3.1

APPENDIX II. Continued.

Picea glauca - Plot 4

Date	Time	A	B	C	D	E	F
May 10	0820	C	-6.0	2.7	1.0	2.7	-3.3
May 14	1140	C	-14.5	8.6	1.0	8.6	-5.9
May 18	0825	C	-7.0	3.7	1.0	3.7	-3.3
May 22	1055	C	-13.0	8.2	1.0	8.2	-4.8
May 26	1045	CL	-12.5	8.0	0.5	4.0	-8.5
May 30	0940	C	-10.5	7.0	1.0	7.0	-3.5
June 3	1040	C	-20.0	8.0	1.0	8.0	-12.0
June 7	0730	C	-7.5	0.9	1.0	0.9	-6.6
June 11	1030	C	-15.0	7.9	1.0	7.9	-7.1
June 15	0945	C	-16.0	7.0	1.0	7.0	-9.0
June 19	0830	S	-13.0	3.7	0.75	2.7	-10.3
June 23	0825	PC	-12.0	3.7	0.75	2.7	-9.3
June 27	0830	PC	-14.0	3.7	0.5	1.8	-12.2
July 1	0855	O	-6.0	5.5	0.25	1.4	-4.6
July 5	0920	O	-5.5	6.0	0.25	1.5	-4.0
July 9	0815	C	-11.5	2.7	1.0	2.7	-8.8
July 13	0715	C	-7.5	0.5	1.0	0.5	-7.0
July 17	0720	F	-10.5	0.5	0.75	0.3	-10.2
July 21	1030	O	-11.0	7.9	0.25	2.0	-9.0
July 25	0900	H	-8.5	5.5	0.75	4.1	-4.4
July 29	0800	C	-5.0	1.8	1.0	1.8	-3.2
Aug 2	0820	O	-2.5	2.7	0.25	0.7	-1.8
Aug 6	1030	O	-11.5	7.9	0.25	2.0	-9.5
Aug 10	0805	O	-7.5	1.8	0.25	0.4	-7.1
Aug 14	0720	O	-4.0	0.5	0.25	0.1	-3.9
Aug 18	0805	C	-8.0	1.8	1.0	1.8	-6.2
Aug 22	0905	CL	-7.5	5.5	0.5	2.8	-4.7

Picea glauca - Plot 5

Date	Time	A	B	C	D	E	F
May 10	0735	C	-5.5	0.9	1.0	0.9	-4.6
May 14	0945	C	-12.5	7.0	1.0	7.0	-5.5
May 18	0735	C	-5.5	0.9	1.0	0.9	-4.6
May 22	0930	C	-12.0	6.5	1.0	6.5	-5.5
May 26	0915	C	-9.0	6.0	1.0	6.0	-3.0
May 30	0800	C	-3.5	1.8	1.0	1.8	-1.7
June 3	1130	C	-9.0	8.5	1.0	8.5	-0.5
June 7	0830	C	-12.0	3.7	1.0	3.7	-8.3
June 11	1130	C	-5.0	8.6	1.0	8.6	+3.6
June 15	0755	C	-14.0	1.8	1.0	1.8	-12.2
June 19	0710	CL	-11.5	0.5	0.5	0.2	-11.3
June 23	0955	PC	-17.5	7.5	0.75	5.6	-11.9
June 27	0715	CL	-12.0	0.5	0.5	0.2	-11.8
July 1	0700	O	-4.0	0	0.25	0	-4.0
July 5	0755	O	-4.0	1.8	0.25	0.5	-3.5
July 9	0910	C	-13.0	6.0	1.0	6.0	-7.0
July 13	0810	C	-9.5	2.7	1.0	2.7	-6.8
July 17	0845	C	-15.0	4.6	1.0	4.6	-10.4
July 21	0940	O	-11.0	7.0	0.25	1.8	-9.2
July 25	1015	H	-17.0	7.7	0.75	5.8	-11.2

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
July 29	0650	C	-4.5	+0.5	1.0	+0.5	-5.0
Aug 2	0650	O	-2.5	+0.5	0.25	+0.1	-2.6
Aug 6	1210	C	-21.0	8.5	1.0	8.5	-12.5
Aug 10	0710	O	-6.0	0.5	0.25	0.1	-5.9
Aug 14	0750	O	-6.0	1.4	0.25	0.3	-5.7
Aug 18	0700	C	-6.5	0.0	1.0	0.0	-6.5
Aug 22	1000	PC	-9.0	7.5	0.75	5.6	-3.4
Picea glauca - Plot 6							
May 10	0715	C	-3.0	0.5	1.0	0.5	-2.5
May 14	1020	C	-16.0	7.7	1.0	7.7	-8.3
May 18	0710	C	-7.5	0.5	1.0	0.5	-7.0
May 22	1000	C	-16.5	7.5	1.0	7.5	-9.0
May 26	0955	C	-8.0	7.5	1.0	7.5	-0.5
May 30	0835	C	-10.5	6.5	1.0	6.5	-4.0
June 3	1205	C	-16.0	8.7	1.0	8.7	-7.3
June 7	0900	C	-19.0	5.5	1.0	5.5	-13.5
June 11	1205	CL	-11.5	8.7	0.5	4.4	-7.1
June 15	0820	C	-15.0	2.7	1.0	2.7	-12.3
June 19	0645	CL	-9.0	+0.5	0.5	+0.2	-9.2
June 23	0935	PC	-14.5	6.5	0.75	4.9	-9.6
June 27	0750	CL	-13.0	1.4	0.5	0.7	-12.3
July 1	0745	O	-3.5	1.35	0.25	0.3	-3.2
July 5	0815	O	-3.5	2.7	0.25	0.7	-2.8
July 9	0940	C	-17.5	7.0	1.0	7.0	-10.5
July 13	0845	C	-6.0	1.4	1.0	1.4	-4.6
July 17	0810	C	-13.0	2.7	1.0	2.7	-10.3
July 21	0925	O	-10.5	6.5	0.25	1.6	-8.9
July 25	1035	H	-18.0	7.9	0.75	5.9	-12.1
July 29	0710	C	-5.0	0.5	1.0	0.5	-4.5
Aug 2	0705	O	-4.0	0	0.25	0	-4.0
Aug 6	1145	CL	-15.0	8.6	0.5	4.3	-10.7
Aug 10	0650	H	-5.5	+0.5	0.75	+0.3	-5.8
Aug 14	0805	O	-4.5	1.8	0.25	0.5	-4.0
Aug 18	0710	C	-6.5	0.5	1.0	0.5	-6.0
Aug 22	1015	PC	-14.5	7.7	0.75	5.8	-8.7
Picea glauca - Plot 9							
May 10	0945	C	-4.5	7.0	1.0	7.0	+2.5
May 14	1330	C	-10.5	7.2	1.0	7.2	-3.3
May 18	0950	C	-8.0	7.0	1.0	7.0	-1.0
May 22	1240	PC	-16.5	8.0	0.75	6.0	-10.5
May 26	0740	C	-4.5	1.4	1.0	1.4	-3.1
May 30	1130	C	-20.0	8.5	1.0	8.5	-11.5
June 3	0950	C	-16.0	7.0	1.0	7.0	-9.0
June 7	1300	CL	-14.5	7.7	0.5	3.9	-10.6
June 11	0905	C	-14.0	5.5	1.0	5.5	-8.5
june 15	1050	C	-15.5	7.0	1.0	7.0	-8.5
June 19	1010	C	-16.0	7.7	1.0	7.7	-8.3
June 23	0720	S	-12.0	0.5	0.75	0.3	-11.7

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
June 27	0935	CL	-14.5	6.5	0.5	3.3	-11.2
July 1	1000	O	-5.0	7.5	0.25	1.9	-3.1
July 5	1035	O	-7.0	7.9	0.25	2.0	-5.0
July 9	0630	C	-6.0	+0.9	1.0	+0.9	-6.9
July 13	0915	C	-15.0	6.0	1.0	6.0	-9.0
July 17	1035	C	-10.5	7.9	1.0	7.9	-2.6
July 21	0825	O	-7.5	3.7	0.25	0.9	-6.6
July 25	0750	H	-6.0	1.4	0.75	1.0	-5.0
July 29	0845	C	-9.0	4.6	1.0	4.6	-4.4
Aug 2	0905	O	-3.0	5.5	0.25	1.4	-1.6
Aug 6	0900	CL	-9.5	5.5	0.5	2.8	-6.7
Aug 10	0850	O	-6.0	4.6	0.25	1.1	-4.9
Aug 14	0900	O	-6.0	5.5	0.25	1.4	-4.6
Aug 18	0850	C	-9.0	5.5	1.0	5.5	-3.5
Aug 22	0800	C	-3.5	1.8	1.0	1.8	-1.7
Picea mariana - Plot 7							
May 10	1115	C	-7.5	11.6	1.0	11.6	+4.1
May 14	0830	C	-12.0	5.5	1.0	5.5	-6.5
May 18	1125	C	-10.5	11.8	1.0	11.8	+1.3
May 22	1330	PC	-12.0	8.3	0.75	6.2	-5.8
May 26	1240	CL	-2.5	10.2	0.5	5.1	+2.6
May 30	0655	C	-9.0	0.0	1.0	0.0	-9.0
June 3	1350	C	-3.5	7.3	1.0	7.3	+3.8
June 7	1010	C	-11.0	10.6	1.0	10.6	-0.4
June 11	0650	C	-9.0	+0.4	1.0	+0.4	-9.4
June 15	0700	C	-12.5	0.0	1.0	0.0	-12.5
June 19	1245	C	-18.5	10.1	1.0	10.1	-8.4
June 23	1235	PC	-14.5	10.8	0.75	10.8	-6.4
June 27	1235	O	-14.0	10.8	0.25	2.7	-11.3
July 1	1230	O	-14.0	10.8	0.25	2.7	-11.3
July 5	1200	PC	-8.0	12.0	0.75	9.0	+1.0
July 9	1315	C	-19.5	9.0	1.0	9.0	-10.5
July 13	1015	C	-12.0	10.6	1.0	10.6	-1.4
July 17	0640	C	-6.0	+1.3	1.0	+1.3	-7.3
July 21	0625	CL	-5.5	+2.0	0.5	+1.0	-6.5
July 25	1240	PC	-16.0	10.1	0.75	7.6	-8.4
July 29	1045	C	-16.0	11.2	1.0	11.2	-4.8
Aug 2	1100	O	-1.0	11.5	0.25	2.9	+1.9
Aug 6	0700	O	-5.0	0.0	0.25	0.0	-5.0
Aug 10	0930	O	-7.5	8.6	0.25	2.2	-5.3
Aug 14	1040	O	-7.5	11.2	0.25	2.8	-4.7
Aug 18	1045	C	-17.0	11.2	1.0	11.2	-5.8
Aug 22	1100	C	-9.5	11.5	1.0	11.5	+2.5
Picea mariana - Plot 8							
May 10	0850	C	-6.0	6.3	1.0	6.3	+0.3
May 14	1225	C	-16.5	10.8	1.0	10.8	-5.7
May 18	0905	C	-10.5	7.0	1.0	7.0	-3.5
May 22	1125	C	-14.5	11.8	1.0	11.8	-2.7

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
May 26	0835	C	-7.0	5.5	1.0	5.5	-1.5
May 30	1015	C	-15.0	10.6	1.0	10.6	-4.4
June 3	1320	C	-19.0	8.3	1.0	8.3	-10.7
June 7	0655	C	-7.5	0.0	1.0	0.0	-7.5
June 11	1005	C	-17.0	10.3	1.0	10.3	-6.7
June 15	1015	C	-16.0	10.6	1.0	10.6	-5.4
June 19	0855	S	-12.0	7.0	0.75	5.25	-7.7
June 23	0800	S	-11.0	4.0	0.75	3.0	-8.0
June 27	0905	CL	-8.5	7.0	0.5	3.5	-5.0
July 1	1300	O	-10.0	9.5	0.25	2.4	-7.6
July 5	0955	O	-4.0	10.3	0.25	2.6	-1.4
July 9	0745	C	-6.5	3.0	1.0	3.0	-3.5
July 13	0645	C	-6.5	+1.0	1.0	+1.0	-7.5
July 17	1000	C	-14.0	10.3	1.0	10.3	-3.7
July 21	1100	O	-9.0	11.5	0.25	2.9	-6.1
July 25	1145	H	-15.5	11.9	0.75	8.9	-6.6
July 29	0825	C	-7.5	5.5	1.0	5.5	-2.0
Aug 2	0845	O	-3.0	6.3	0.25	1.6	-1.4
Aug 6	1000	O	-10.5	10.3	0.25	2.6	-7.9
Aug 10	0830	O	-8.0	5.5	0.25	1.4	-6.6
Aug 14	0700	O	-6.0	0.0	0.25	0.0	-6.0
Aug 18	0830	C	-9.5	5.5	1.0	5.5	-4.0
Aug 22	0840	CL	-4.5	6.3	0.5	3.1	-1.4
Populus tremuloides - Plot 10							
May 30	1230	CL	-11.0	7.0	0.5	3.5	-7.5
June 3	0810	C	-8.0	3.0	1.0	3.0	-5.1
June 7	1120	C	-9.5	6.5	1.0	6.5	-3.0
June 11	0815	C	-6.0	3.0	1.0	3.0	-3.0
June 15	1310	C	-16.0	6.9	1.0	6.9	-9.1
June 19	1100	C	-14.0	6.3	1.0	6.3	-7.7
June 23	1130	C	-15.5	6.6	1.0	6.6	-8.9
June 27	1045	CL	-13.5	6.2	0.5	3.1	-10.4
July 1	1050	O	-3.5	6.2	0.25	1.6	-1.9
July 5	0640	O	-3.0	+0.6	0.25	+0.2	-3.2
July 9	1120	C	-16.0	6.5	1.0	6.5	-9.5
July 13	1145	PC	-17.5	6.8	0.75	5.1	-12.4
July 17	1140	C	-19.0	6.8	1.0	6.8	-12.2
July 21	0710	O	-4.5	0.6	0.25	0.2	-4.3
July 25	0640	H	-2.0	+0.6	0.75	+0.5	-2.5
July 29	0940	C	-9.5	5.6	1.0	5.6	-3.9
Aug 2	1015	O	-5.0	4.7	0.25	1.2	-3.8
Aug 6	0750	CL	-8.5	1.9	0.5	0.9	-7.6
Aug 10	1025	O	-9.5	6.2	0.25	1.5	-8.0
Aug 14	0940	O	-9.0	5.6	0.25	1.4	-7.6
Aug 18	0930	C	-14.5	5.1	1.0	5.1	-9.4
Aug 22	0740	O	-6.0	1.9	0.25	0.5	-5.5
Populus tremuloides - Plot 11							
June 11	1300	CL	-11.5	15.6	0.5	7.8	-3.7

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
June 15	0905	C	-13.0	10.6	1.0	10.6	-2.4
June 19	0755	CL	-6.5	1.6	0.5	0.8	-5.7
June 23	0900	RC	-13.5	10.6	0.75	8.0	-5.5
June 27	1100	CL	-7.5	15.2	0.5	7.6	+0.1 ✓
July 1	0825	O	-5.0	6.1	0.25	1.5	-3.5
July 5	0900	O	-4.0	10.6	0.25	2.7	-1.3
July 9	1050	C	-16.0	15.1	1.0	15.1	-0.9
July 13	0840	C	-9.0	8.4	1.0	8.4	-0.6
July 17	0925	C	-16.5	12.6	1.0	12.6	-3.9
July 21	0905	PC	-10.5	10.6	0.5	5.3	-5.2
July 25	0950	C	-16.0	13.6	1.0	13.6	-2.4
July 29	0740	C	-3.0	1.2	1.0	1.2	-1.8
Aug 2	0740	O	-3.0	1.2	0.25	0.3	-2.7
Aug 6	1125	CL	-12.0	15.6	0.5	7.8	-4.2
Aug 10	0740	O	-8.5	1.2	0.25	0.3	-8.2
Aug 14	0835	O	-7.0	6.1	0.25	1.5	-5.5
Aug 18	0740	C	-12.5	1.2	1.0	1.2	-11.3
Aug 22	0935	PC	-10.0	12.6	0.75	9.5	-0.5
Prunus pensylvanica - Plot 9							
May 22	1240	PC	-11.0	12.2	0.75	9.1	-1.9
May 26	0740	C	-4.0	1.1	1.0	1.1	-2.9
May 30	1130	C	-15.0	11.3	1.0	11.3	-3.7
June 3	0950	C	-20.0	7.5	1.0	7.5	-12.5
June 7	1300	CL	-17.0	12.2	0.5	6.1	-10.9
June 11	0905	C	-18.5	4.5	1.0	4.5	-14.0
June 15	1050	C	-17.5	10.0	1.0	10.0	-7.5
June 19	1010	C	-20.5	9.0	1.0	9.0	-11.5
June 23	0720	S	-12.0	0.4	0.75	0.3	-11.7
June 27	0935	CL	-10.0	6.5	0.5	3.3	-6.7
July 1	1000	O	-6.5	8.5	0.25	2.1	-4.4
July 5	1035	O	-4.0	9.5	0.25	2.4	-1.6
July 9	0630	C	-6.5	+0.8	1.0	+0.8	-7.3
July 13	0915	C	-17.5	5.5	1.0	5.5	-12.0
July 17	1035	C	-12.5	9.5	1.0	9.5	-3.0
July 21	0825	O	-6.5	3.0	0.25	0.8	-5.7
July 25	0750	H	-6.0	1.1	0.75	0.8	-5.2
July 29	0845	C	-6.0	3.8	1.0	3.8	-2.2
Aug 2	0905	O	-2.5	4.5	0.25	1.1	-1.4
Aug 6	0900	O	-7.5	4.5	0.25	1.1	-6.4
Aug 10	0850	O	-8.5	3.8	0.25	0.9	-7.6
Aug 14	0900	O	-7.5	4.5	0.25	1.1	-6.4
Aug 18	0850	C	-6.0	3.8	1.0	3.8	-2.2
Aug 22	0800	C	-1.0	1.5	1.0	1.5	+0.5
Prunus pensylvanica - Plot 10							
May 22	0815	C	-7.5	1.0	1.0	1.0	-6.5
May 26	1115	CL	-12.0	3.0	0.5	1.5	-10.5
May 30	1230	CL	-19.0	3.7	0.5	1.9	-17.1
June 3	0810	C	-7.5	1.0	1.0	1.0	-6.5

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
June 7	1120	C	-18.5	3.0	1.0	3.0	-15.5
June 11	0815	C	-12.0	1.0	1.0	1.0	-11.0
June 15	1310	C	-13.5	3.9	1.0	3.9	-9.6
June 19	1100	C	-12.0	2.8	1.0	2.8	-9.2
June 23	1130	C	-19.0	3.1	1.0	3.1	-15.9
June 27	1045	CL	-14.0	2.6	0.5	1.3	-12.7
July 1	1050	O	-6.0	2.6	0.25	0.7	-5.3
July 5	0640	O	-2.5	+0.2	0.25	+0.1	-2.6
July 9	1120	C	-12.5	3.0	1.0	3.0	-9.5
July 13	1145	PC	-14.0	3.3	0.75	2.4	-11.6
July 17	1140	C	-18.0	3.3	1.0	3.3	-14.7
July 21	0710	O	-4.0	0.2	0.25	0.1	-3.9
July 25	0640	H	-4.0	+0.2	0.75	+0.2	-4.2
July 29	0940	C	-10.5	1.9	1.0	1.9	-8.6
Aug 2	1015	O	-1.5	2.2	0.25	0.6	-0.9
Aug 6	0750	CL	-6.0	0.6	0.5	0.3	-5.7
Aug 10	1025	O	-10.0	2.4	0.25	0.6	-9.4
Aug 14	0940	O	-7.5	1.9	0.25	0.5	-7.0
Aug 18	0930	C	-12.5	1.7	1.0	1.7	-10.8
Aug 22	0740	O	-2.5	0.6	0.25	0.2	-2.3
Pyrola asarifolia - Plot 3							
May 18	0935	PC	-7.5	4.4	0.75	3.3	-4.2
May 22	1220	C	-15.0	6.2	1.0	6.2	-8.8
May 26	0715	C	-1.5	0.5	1.0	0.5	-1.0
May 30	1035	C	-17.5	6.0	1.0	6.0	-11.5
June 3	0915	C	-25.0	3.7	1.0	3.7	-21.3
June 7	1225	C	-8.0	6.2	1.0	6.2	-1.8
June 11	0940	C	-11.5	5.1	1.0	5.1	-6.4
June 15	1130	C	-19.0	6.2	1.0	6.2	-12.8
June 19	1030	C	-11.0	6.0	1.0	6.0	-5.0
June 23	0705	S	-6.5	0.0	0.75	0.0	-6.5
June 27	1015	CL	-13.0	5.9	0.5	2.9	-10.1
July 1	0940	O	-2.0	5.1	0.25	1.3	-0.7
July 5	1045	O	-3.0	6.1	0.25	1.5	-1.5
July 9	0710	C	-3.0	0.5	1.0	0.5	-2.5
July 13	0945	C	-9.0	5.1	1.0	5.1	-3.9
July 17	1105	C	-12.0	6.2	1.0	6.2	-5.8
July 21	0850	O	-4.0	2.7	0.25	0.7	-3.3
July 25	0820	H	-3.0	2.2	0.75	1.6	-1.4
July 29	0915	C	-3.5	3.7	1.0	3.7	+0.2
Aug 2	0925	O	-2.5	4.4	0.25	1.1	-1.4
Aug 6	0940	CL	-5.5	5.1	0.5	2.5	-3.0
Aug 10	0905	O	-6.5	3.0	0.25	0.8	-5.7
Aug 14	0915	O	-3.5	3.7	0.25	0.9	-2.6
Aug 18	0910	C	-2.0	3.7	1.0	3.7	+1.7
Aug 22	0815	CL	-2.5	2.2	0.5	1.1	-1.4
Pyrola asarifolia - Plot 5							
May 26	0915	C	-2.5	3.7	1.0	3.7	+1.2

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
May 30	0800	C	-10.0	1.9	1.0	1.9	-8.1
June 3	1130	C	-11.5	6.2	1.0	6.2	-5.3
June 7	0830	C	-7.5	2.5	1.0	2.5	-5.0
June 11	1120	C	-20.0	6.2	1.0	6.2	-13.8
June 15	0755	C	-10.0	1.9	1.0	1.9	-8.1
June 19	0710	CL	-10.0	0.5	0.5	0.2	-9.8
June 23	0955	PC	-11.0	5.8	0.75	4.3	-6.7
June 27	0715	CL	-7.5	0.5	0.5	0.2	-7.3
July 1	0700	O	-2.5	0.0	0.25	0.0	-2.5
July 5	0755	O	-2.0	1.9	0.25	0.5	-1.5
July 9	0910	C	-5.0	3.7	1.0	3.7	-1.3
July 13	0810	C	-8.0	2.2	1.0	2.2	-5.8
July 17	0845	C	-7.5	2.7	1.0	2.7	-4.8
July 21	0940	O	-4.0	5.1	0.25	1.3	-2.7
July 25	1015	H	-9.0	5.9	0.75	4.4	-4.6
July 29	0650	C	-3.5	+0.2	1.0	+0.2	-3.7
Aug 2	0650	O	-4.0	+0.2	0.25	+0.1	-4.1
Aug 6	1210	C	-9.5	6.2	1.0	6.2	-3.3
Aug 10	0710	O	-4.5	0.5	0.25	0.1	-4.4
Aug 14	0750	O	-2.5	1.4	0.25	0.4	-2.1
Aug 18	0700	C	-3.0	0.0	1.0	0.0	-3.0
Aug 22	1000	PC	-4.0	5.6	0.75	4.3	+0.3
Pyrola asarifolia - Plot 6							
May 26	0955	C	-2.0	5.8	1.0	5.8	+3.8
May 30	0835	C	-14.0	2.5	1.0	2.5	-11.5
June 3	1205	C	-13.0	6.2	1.0	6.2	-6.8
June 7	0900	C	-7.5	3.0	1.0	3.0	-4.5
June 11	1205	CL	-15.0	6.2	0.5	3.1	-11.9
June 15	0820	C	-12.5	2.2	1.0	2.2	-10.3
June 19	0645	CL	-19.5	+0.2	0.5	+0.1	-19.6
June 23	0935	PC	-16.0	4.4	0.75	3.3	-12.7
June 27	0750	CL	-7.5	1.4	0.5	0.7	-6.8
July 1	0745	O	-2.0	1.4	0.25	0.4	-1.6
July 5	0815	O	-2.0	2.2	0.25	0.5	-1.5
July 9	0940	C	-8.5	5.1	1.0	5.1	-3.4
July 13	0745	C	-4.5	1.4	1.0	1.4	-3.1
July 17	0810	C	-8.0	2.2	1.0	2.2	-5.8
July 21	0925	O	-4.0	4.4	0.25	1.1	-2.9
July 25	1035	H	-11.0	6.0	0.75	1.5	-9.5
July 29	0710	C	-1.5	0.5	1.0	0.5	-1.0
Aug 2	0705	O	-5.0	0.0	0.25	0.0	-5.0
Aug 6	1145	CL	-8.0	6.2	0.5	3.1	-4.9
Aug 10	0650	H	-2.5	+0.2	0.75	+0.2	-2.7
Aug 14	0805	O	-4.0	1.9	0.25	1.4	-2.6
Aug 18	0710	C	-3.5	0.5	1.0	0.5	-3.0
Aug 22	1015	PC	-4.5	5.9	0.75	4.4	-0.1
Pyrola asarifolia - Plot 9							
May 22	1240	PC	-22.0	6.1	0.75	4.6	-17.4

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
May 26	0740	C	-3.5	1.4	1.0	1.4	-2.1
May 30	1130	C	-26.0	6.2	1.0	6.2	-19.8
June 3	0950	C	-26.0	5.1	1.0	5.1	-20.9
June 7	1010	CL	-25.0	5.9	0.5	2.9	-22.1
June 11	0905	C	-9.0	3.0	1.0	3.0	-6.0
June 15	1050	C	-17.0	6.1	1.0	6.1	-10.9
June 19	1010	C	-13.5	5.9	1.0	5.9	-7.7
June 23	0720	S	-9.0	1.0	0.75	0.7	-8.3
June 27	0935	CL	-12.5	4.4	0.5	2.2	-10.3
July 1	1000	O	-3.0	5.8	0.25	1.4	-1.6
July 5	1035	O	-1.5	6.0	0.25	1.5	-0.0
July 9	0630	C	-3.5	+0.8	1.0	+0.8	-4.3
July 13	0915	C	-11.5	3.7	1.0	3.7	-7.8
July 17	1035	C	-9.5	6.0	1.0	6.0	-3.5
July 21	0825	O	-3.0	2.5	0.25	0.6	-2.4
July 25	0750	H	-3.5	1.4	0.75	1.1	-2.4
July 29	0845	C	-4.5	2.7	1.0	2.7	-1.8
Aug 2	0905	O	-2.0	3.0	0.25	0.8	-1.2
Aug 6	0900	O	-7.0	3.0	0.25	0.8	-6.2
Aug 10	0850	O	-6.0	2.7	0.25	0.7	-5.3
Aug 14	0900	O	-5.0	3.0	0.25	0.8	-4.2
Aug 18	0850	C	-3.0	2.7	1.0	2.7	-0.3
Aug 22	0800	C	-1.0	1.9	1.0	1.9	+0.9
Pyrola asarifolia - Plot 10							
May 14	1400	C	-17.5	5.9	1.0	5.9	-11.6
May 18	1020	C	-1.0	5.9	1.0	5.9	+4.9
May 22	0815	C	-21.0	2.2	1.0	2.2	-18.8
May 26	1115	CL	-20.0	6.2	0.5	3.1	-16.9
May 30	1230	CL	-35.0	6.2	0.5	3.5	-31.5
June 3	0810	C	11.0	2.2	1.0	2.2	-8.8
June 7	1120	C	-13.0	6.2	1.0	6.2	-6.8
June 11	0815	C	-14.0	2.2	1.0	2.2	-11.8
June 15	1310	C	-13.5	6.1	1.0	6.1	-7.4
June 19	1100	C	-11.0	6.2	1.0	6.2	-4.8
June 23	1130	C	-10.5	6.2	1.0	6.2	-4.3
June 27	1045	CL	-9.5	6.1	0.5	3.0	-6.5
July 1	1050	O	-3.5	6.1	0.25	1.5	-2.0
July 5	0640	O	-1.5	+0.2	0.25	+0.1	-1.5
July 9	1120	C	-8.0	6.2	1.0	6.2	-1.8
July 13	1145	PC	-7.5	6.2	0.75	4.7	-2.8
July 17	1140	C	-8.0	6.2	1.0	6.2	-1.8
July 21	0710	O	-2.0	0.5	0.25	0.1	-1.9
July 25	0640	H	-1.5	+0.2	0.75	+0.2	-1.7
July 29	0940	C	-2.0	5.1	1.0	5.1	+3.1
Aug 2	1015	O	-2.0	5.9	0.25	1.5	-0.5
Aug 6	0750	CL	-6.5	1.4	0.5	0.7	-5.8
Aug 10	1025	O	-5.5	6.0	0.25	1.5	-4.0
Aug 14	0940	O	-5.0	5.1	0.25	1.3	-3.7
Aug 18	0930	C	-4.0	4.4	1.0	4.4	+0.4

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
Aug 22	0740	O	-1.0	1.4	0.25	0.4	-0.6
Pyrola asarifolia - Plot 11							
June 11	1300	CL	-12.0	6.1	0.5	3.1	-9.0
June 15	0905	C	-16.0	3.0	1.0	3.0	-13.0
June 19	0755	CL	-8.5	1.9	0.5	1.0	-7.5
June 23	0900	PC	-10.0	3.0	0.75	2.3	-7.7
June 27	1100	CL	-8.0	6.2	0.5	3.1	-4.9
July 1	0825	O	-2.0	2.5	0.25	0.6	-1.4
July 5	0900	O	-1.5	3.0	0.25	0.8	-0.7
July 9	1050	C	-8.5	6.1	1.0	6.1	-2.4
July 13	0840	C	-7.5	2.7	1.0	2.7	-4.8
July 17	0925	C	-7.5	4.4	1.0	4.4	-3.1
July 21	0905	CL	-4.5	3.0	0.5	1.5	-3.0
July 25	0950	C	-7.0	5.1	1.0	5.1	-1.9
July 29	0740	C	-3.0	1.4	1.0	1.4	-1.6
Aug 2	0740	O	-4.0	1.4	0.25	0.4	-3.6
Aug 6	1125	CL	-7.5	6.2	0.5	3.1	-4.4
Aug 10	0740	O	-3.0	1.4	0.25	0.4	-2.6
Aug 14	0835	O	-4.0	2.5	0.25	0.6	-3.4
Aug 18	0740	C	-3.0	1.4	1.0	1.4	-1.6
Aug 22	0935	PC	-10.0	4.4	0.75	3.3	-6.7
Rosa acicularis - Plot 1							
June 3	0735	C	-12.0	1.0	1.0	1.0	-11.0
June 7	1100	C	-11.0	10.2	1.0	10.2	-0.8
June 11	0720	C	-7.5	0.5	1.0	0.5	-7.0
June 15	1200	C	-18.5	11.5	1.0	11.5	-7.0
June 19	0920	S	-19.0	5.7	0.75	4.3	-14.7
June 23	1205	PC	-12.5	11.5	0.75	8.6	-3.9
June 27	1200	CL	-17.5	11.5	0.5	5.8	-11.7
July 1	1200	PC	-5.0	11.5	0.75	8.6	+3.6
July 5	1125	CL	-3.0	10.9	0.5	5.4	+2.4
July 9	1230	C	-17.5	11.9	1.0	11.9	-5.6
July 13	1045	C	-17.5	9.6	1.0	9.6	-7.9
July 17	1245	PC	-15.0	12.1	0.75	9.1	-5.9
July 21	0645	O	-3.5	+0.5	0.25	+0.1	-3.6
July 25	1205	H	-13.0	11.5	0.75	8.6	-4.4
July 29	1020	C	-10.0	8.4	1.0	8.4	-1.6
Aug 2	0955	O	-2.5	7.8	0.25	2.0	-0.5
Aug 6	0720	CL	-3.5	0.5	0.5	0.3	-3.2
Aug 10	1005	O	-7.0	7.8	0.25	2.0	-5.0
Aug 14	1020	O	-5.5	8.4	0.25	2.1	-3.4
Aug 18	1030	C	-16.5	9.0	1.0	9.0	-7.5
Aug 22	0700	CL	-0.0	0.0	0.5	0.0	-0.0
Rosa acicularis - Plot 2							
June 3	0825	C	-15.0	3.5	1.0	3.5	-11.5
June 7	1155	C	-20.0	11.5	1.0	11.5	-8.5
June 11	0850	C	-13.0	1.5	1.0	1.5	-11.5

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
June 15	1235	C	-20.0	11.9	1.0	11.9	-8.1
June 19	1150	S	-16.0	11.2	0.75	8.4	-7.6
June 23	1110	C	-19.5	10.5	1.0	10.5	-9.0
June 27	1130	CL	-13.0	10.9	0.5	5.4	-7.6
July 1	1120	O	-3.5	10.5	0.25	2.6	-0.9
July 5	0710	O	-2.0	0.5	0.25	0.1	-1.9
July 9	1210	C	-14.5	11.7	1.0	11.7	-2.8
July 13	1110	C	-8.5	10.5	1.0	10.5	+2.0
July 17	1220	PC	-15.0	11.7	0.75	8.8	-6.2
July 21	0750	O	-7.5	1.5	0.25	0.4	-7.1
July 25	0720	H	-2.0	0.5	0.75	0.4	-1.6
July 29	1000	C	-14.5	7.8	1.0	7.8	-6.7
Aug 2	1040	O	-3.0	9.6	0.25	2.4	-0.6
Aug 6	0830	CL	-7.5	3.5	0.25	0.9	-6.6
Aug 10	1050	O	-8.5	9.6	0.25	2.4	-6.1
Aug 14	1000	O	-6.0	7.8	0.25	2.0	-4.0
Aug 18	1000	C	-11.5	7.8	1.0	7.8	-3.7
Aug 22	0720	CL	-1.0	0.5	0.5	0.3	-0.7
Rosa acicularis - Plot 3							
June 3	0915	C	-13.0	5.7	1.0	5.7	-7.3
June 7	1225	C	-13.0	11.9	1.0	11.9	-1.1
June 11	0940	C	-18.0	7.1	1.0	7.1	-10.9
June 15	1130	C	-13.5	10.9	1.0	10.9	-2.6
June 19	1030	C	-10.0	9.0	1.0	9.0	-1.0
June 23	0705	S	-5.0	0.0	0.75	0.0	-5.0
June 27	1015	C	-11.0	8.4	0.5	4.2	-6.8
July 1	0940	O	-5.0	7.1	0.25	1.8	-3.2
July 5	1045	O	-3.5	9.6	0.25	2.4	-1.1
July 9	0710	C	-3.0	0.5	1.0	0.5	-2.5
July 13	0945	C	-9.0	7.1	1.0	7.1	-1.9
July 17	1105	C	-12.0	10.2	1.0	10.2	-1.8
July 21	0850	O	-5.0	4.3	0.25	1.1	-3.9
July 25	0820	H	-3.5	2.8	0.75	2.1	-1.4
July 29	0915	C	-7.5	5.7	1.0	5.7	-1.8
Aug 2	0925	O	-3.5	6.4	0.25	1.6	-1.9
Aug 6	0940	CL	-8.0	7.1	0.5	3.6	-4.4
Aug 10	0905	O	-5.5	5.0	0.25	1.3	-4.2
Aug 14	0915	O	-4.5	5.7	0.25	1.4	-3.1
Aug 18	0910	C	-9.0	5.7	1.0	5.7	-3.3
Aug 22	0815	CL	-1.0	2.8	0.5	1.4	+0.4
Rosa acicularis - Plot 5							
May 26	0915	C	-7.0	5.8	1.0	5.8	-1.2
May 30	0800	C	-5.5	2.0	1.0	2.0	-3.5
June 3	1130	C	-14.0	10.3	1.0	10.3	-3.7
June 7	0830	C	-6.5	3.5	1.0	3.5	-3.0
June 11	1130	C	-15.5	10.3	1.0	10.3	-5.2
June 15	0755	C	-15.0	2.0	1.0	2.0	-13.0

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
June 19	0710	CL	-2.5	0.5	0.5	0.3	-2.2
June 23	0955	PC	-7.0	8.0	0.75	6.0	-1.0
June 27	0715	CL	-4.0	0.5	0.5	0.3	-3.7
July 1	0700	O	-3.0	0.0	0.25	0.0	-3.0
July 5	0755	O	-1.5	2.0	0.25	0.5	-1.0
July 9	0910	C	-7.5	5.8	1.0	5.8	-1.7
July 13	0810	C	-7.5	2.8	1.0	2.8	-4.7
July 17	0845	C	-6.0	4.3	1.0	4.3	-1.7
July 21	0940	O	-5.0	7.3	0.25	1.8	-3.2
July 25	1015	H	-12.0	8.8	0.75	6.6	-5.4
July 29	0650	C	-4.0	+03	1.0	+0.3	-4.3
Aug 2	0650	O	-2.0	+0.3	0.25	+0.1	-2.1
Aug 6	1210	C	-11.0	9.1	1.0	9.1	-1.9
Aug 10	0710	O	-4.5	0.5	0.25	0.1	-4.4
Aug 14	0750	O	-5.0	1.5	0.25	0.4	-4.6
Aug 18	0700	C	-5.0	0.0	1.0	0.0	-5.0
Aug 22	1000	PC	-8.0	8.0	0.75	6.0	-2.0
Rosa acicularis - Plot 9							
May 22	1240	PC	-17.0	12.1	0.75	9.1	-7.9
May 26	0740	C	-3.5	1.5	1.0	1.5	-2.0
May 30	1130	C	-14.0	10.9	1.0	10.9	-3.1
June 3	0950	C	-16.5	7.1	1.0	7.1	-9.4
June 7	1010	CL	-18.5	8.4	0.5	4.2	-14.3
June 11	0905	C	-17.5	5.0	1.0	5.0	-12.5
June 15	1050	C	-19.0	9.6	1.0	9.6	-9.4
June 19	1010	C	-16.0	8.4	1.0	8.4	-7.6
June 23	0720	S	-8.0	0.5	0.75	0.4	-7.6
June 27	0935	CL	-15.0	6.4	0.5	3.2	-11.8
July 1	1000	O	-6.5	7.8	0.25	2.0	-4.5
July 5	1035	O	-4.0	9.0	0.25	2.3	-1.7
July 9	0630	C	-5.0	+1.0	1.0	+1.0	-6.0
July 13	0915	C	-15.0	5.7	1.0	5.7	-9.3
July 17	1035	C	-16.5	9.0	1.0	9.0	-7.5
July 21	0825	O	-3.5	3.5	0.25	0.9	-3.6
July 25	0750	H	-4.5	1.5	0.75	1.1	-3.4
July 29	0845	C	-10.0	4.3	1.0	4.3	-5.7
Aug 2	0905	O	-1.5	5.0	0.25	1.3	-0.2
Aug 6	0900	CL	-7.5	5.0	0.5	2.5	-5.0
Aug 10	0850	O	-6.0	4.3	0.25	1.1	-4.9
Aug 14	0900	O	-7.5	5.0	0.25	1.3	-6.2
Aug 18	0850	C	-10.5	4.3	1.0	4.3	-6.2
Aug 22	0800	C	-1.5	2.0	1.0	2.0	+0.5
Rosa acicularis - Plot 10							
May 22	0815	C	-15.0	1.9	1.0	1.9	-13.1
May 26	1115	CL	-7.5	5.7	0.5	2.9	-4.6
May 30	1230	CL	-14.0	6.9	0.5	3.5	-10.5
June 3	0810	C	-11.5	1.9	1.0	1.9	-9.6
June 7	1120	C	-11.0	5.7	1.0	5.7	-5.3

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
June 11	0815	C	-9.0	1.9	1.0	1.9	-7.1
June 15	1310	C	-13.5	7.2	1.0	7.2	-6.3
June 19	1100	C	-8.5	5.4	1.0	5.4	-3.1
June 23	1130	C	-8.0	6.0	1.0	6.0	-2.0
June 27	1045	CL	-8.0	5.1	0.5	2.5	-5.5
July 1	1050	CL	-2.5	5.1	0.25	1.3	-1.2
July 5	0640	O	-1.5	+0.5	0.25	+0.1	-1.6
July 9	1120	C	-8.5	5.7	1.0	5.7	-2.8
July 13	1145	PC	-11.0	6.3	0.75	4.7	-6.3
July 17	1140	C	-10.0	6.3	1.0	6.3	-3.7
July 21	0710	O	-3.5	0.4	0.25	0.1	-3.4
July 25	0640	H	-2.0	+0.5	0.75	0.4	-2.4
July 29	0940	C	-7.5	3.7	1.0	3.7	-3.8
Aug 2	1015	O	-0.5	4.4	0.25	1.1	+0.6
Aug 6	0750	CL	-7.5	1.2	0.5	0.6	-6.9
Aug 10	1025	O	-9.0	4.7	0.25	1.2	-7.8
Aug 14	0940	O	-7.5	3.7	0.25	0.9	-6.6
Aug 18	0930	C	-8.0	3.3	1.0	3.3	-4.7
Aug 22	0740	O	-1.0	1.2	0.25	0.3	-0.7
Rosa acicularis - Plot 11							
June 11	1300	CL	-13.5	8.0	0.5	4.0	-9.5
June 15	0905	C	-11.5	5.0	1.0	5.0	-6.5
June 19	0755	CL	-7.5	2.0	0.5	1.0	-6.5
June 23	0900	PC	-9.5	5.0	0.75	3.8	-5.7
June 27	1100	CL	-5.5	11.0	0.5	5.5	-0.0
July 1	0825	O	-3.0	3.5	0.25	0.9	-2.1
July 5	0900	O	-2.0	5.0	0.25	1.3	-0.7
July 9	1050	C	-9.0	10.3	1.0	10.3	+1.3
July 13	0840	C	-9.5	4.3	1.0	4.3	-5.2
July 17	0925	C	-11.5	6.5	1.0	6.5	-5.0
July 21	0905	CL	-6.5	5.0	0.5	2.5	-4.0
July 25	0950	C	-7.5	7.3	1.0	7.3	-0.2
July 29	0740	C	-5.5	1.5	1.0	1.5	-4.0
Aug 2	0740	O	-1.5	1.5	0.25	0.4	-1.1
Aug 6	1125	CL	-13.0	10.3	0.5	5.1	-7.9
Aug 10	0740	O	-7.0	1.5	0.25	0.4	-6.4
Aug 14	0835	O	-8.0	3.5	0.25	0.9	-7.1
Aug 18	0740	C	-5.5	1.5	1.0	1.5	-4.0
Aug 22	0935	PC	-7.0	6.5	0.75	4.9	-2.1
Rubus pubescens - Plot 3							
June 3	0915	C	-12.5	5.5	1.0	5.5	-7.0
June 7	1225	C	-13.0	9.2	1.0	9.2	-3.8
June 11	0940	C	-13.0	6.7	1.0	6.7	-6.3
June 15	1130	C	-9.0	9.2	1.0	9.2	+0.2
June 19	1030	C	-12.5	8.0	1.0	8.0	-4.5
June 23	0705	S	-9.0	0.05	0.75	0.0	-9.0
June 27	1015	CL	-13.5	7.6	0.5	3.8	-9.7
July 1	0940	O	-2.0	6.7	0.25	1.7	-0.3

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
July 5	1045	O	-5.0	8.3	0.25	2.1	-2.9
July 9	0710	C	-5.5	0.5	1.0	0.5	-5.0
July 13	0945	C	-13.0	6.7	1.0	6.7	-6.3
July 17	1105	C	-14.5	8.7	1.0	8.7	-5.8
July 21	0850	O	-5.0	4.3	0.25	1.1	-3.9
July 25	0820	H	-3.5	2.9	0.75	2.2	-1.3
July 29	0915	C	-10.5	5.6	1.0	5.6	-4.9
Aug 2	0925	O	-1.0	6.1	0.25	1.5	+0.5
Aug 6	0940	CL	-11.5	6.7	0.5	3.3	-8.2
Aug 10	0905	O	-8.0	5.6	0.25	1.3	-6.7
Aug 14	0915	O	-4.5	5.6	0.25	1.4	-3.1
Aug 18	0910	C	-6.5	5.6	1.0	5.6	-0.9
Aug 22	0815	CL	-2.5	2.9	0.5	1.5	-1.0
Rubus pubescens - Plot 5							
May 26	0915	C	-6.5	5.6	1.0	5.6	-0.9
May 30	0800	C	-9.0	2.2	1.0	2.2	-6.8
June 3	1130	C	-14.5	9.2	1.0	9.2	-5.3
June 7	0830	C	-13.5	3.6	1.0	3.6	-9.9
June 11	1130	C	-13.5	9.2	1.0	9.2	-4.3
June 15	0755	C	-13.0	2.2	1.0	2.2	-10.8
June 19	0710	CL	-10.5	0.6	0.5	0.3	-10.2
June 23	0955	PC	-12.0	7.2	0.75	5.4	-6.6
June 27	0715	CL	-5.0	0.6	0.5	0.3	-4.7
July 1	0700	O	-2.0	0.0	0.25	0.0	-2.0
July 5	0755	O	-2.0	2.2	0.25	0.6	-1.4
July 9	0910	C	-11.0	5.6	1.0	5.6	-5.4
July 13	0810	C	-5.5	2.9	1.0	2.9	-2.6
July 17	0845	C	-7.0	4.3	1.0	4.3	-2.7
July 21	0940	O	-5.0	6.7	0.25	1.6	-3.4
July 25	1015	H	-6.5	7.6	0.75	4.3	-2.2
July 29	0750	C	-3.5	+0.6	1.0	+0.6	-4.1
Aug 2	0650	O	-0.0	+0.6	0.25	+0.1	+0.1
Aug 6	1210	C	-8.5	9.5	1.0	9.5	+1.0
Aug 10	0710	O	-7.5	0.6	0.25	0.1	-7.4
Aug 14	0750	O	-6.5	1.7	0.25	0.4	-6.1
Aug 18	0700	C	-9.5	0.0	1.0	0.0	-9.5
Aug 22	1000	PC	-14.0	7.2	0.75	5.4	-8.6
Rubus pubescens - Plot 6							
May 26	0955	C	-7.0	7.2	1.0	7.2	+0.2
May 30	0835	C	-9.5	3.6	1.0	3.6	-5.9
June 3	1305	C	-12.0	9.7	1.0	9.7	-2.3
June 7	0900	C	-13.5	5.0	1.0	5.0	-8.5
June 11	1205	CL	-13.0	9.7	0.5	4.9	-8.1
June 15	0820	C	-12.5	2.9	1.0	2.9	-9.6
June 19	0645	CL	-14.0	+0.6	0.5	+0.3	-14.3
June 23	0935	PC	-15.5	6.1	0.75	4.6	-10.9
June 27	0750	CL	-8.0	1.7	0.5	0.8	-7.2
July 1	0745	O	-2.0	1.7	0.25	0.4	-1.6

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
July 5	0815	O	-2.0	2.9	0.25	0.7	-1.3
July 9	0940	C	-7.5	6.7	1.0	6.7	-0.8
July 13	0745	C	-6.5	1.7	1.0	1.7	-4.8
July 17	0810	C	-8.0	2.9	1.0	2.9	-5.1
July 21	0925	O	-6.5	6.1	0.25	1.5	-5.0
July 25	1035	H	-16.5	8.0	0.75	6.0	-10.5
July 29	0710	C	-3.0	0.6	1.0	0.6	-2.4
Aug 2	0705	O	-8.5	0.0	0.25	0.0	-8.5
Aug 6	1145	CL	-11.5	9.5	0.25	2.4	-9.1
Aug 10	0940	H	-5.5	+0.6	0.75	+0.4	-5.9
Aug 14	0805	O	-4.8	2.2	0.25	0.6	-4.2
Aug 18	0710	C	-4.0	0.6	1.0	0.6	-3.4
Aug 22	1015	PC	-8.5	7.6	0.75	5.7	-2.8
Rubus pubescens - Plot 9							
May 26	0740	C	-2.5	1.7	1.0	1.7	-0.8
May 30	1130	C	-14.0	9.2	1.0	9.2	-4.8
June 3	0950	C	-13.0	6.7	1.0	6.7	-6.3
June 7	1010	CL	-14.5	7.6	0.5	3.8	-10.7
June 11	0905	C	-13.0	5.0	1.0	5.0	-8.0
June 15	1050	C	-12.0	8.3	1.0	8.3	-3.7
June 19	1010	C	-15.5	7.6	1.0	7.6	-7.9
June 23	0720	S	-11.0	0.6	0.75	0.4	-10.6
June 27	0935	CL	-13.5	6.1	0.5	3.1	-10.4
July 1	1000	O	-4.0	7.2	0.25	1.8	-2.2
July 5	1035	O	-2.5	8.0	0.25	2.0	-0.5
July 9	0630	C	-4.5	+1.1	1.0	+1.1	-5.4
July 13	0915	C	-15.0	5.6	1.0	5.6	-9.4
July 17	1035	C	-13.0	8.0	1.0	8.0	-5.0
July 21	0825	O	-13.5	3.6	0.25	0.9	-12.6
July 25	0750	H	-4.0	1.7	0.75	1.2	-2.8
July 29	0945	C	-8.0	4.3	1.0	4.3	-3.7
Aug 2	0905	O	-2.5	5.0	0.25	1.3	-1.2
Aug 6	0900	O	-16.5	5.0	0.25	1.3	-15.2
Aug 10	0850	O	-10.0	4.3	0.25	1.8	-8.2
Aug 14	0900	O	-1.5	5.0	0.25	1.3	-9.2
Aug 18	0850	C	-7.0	4.3	1.0	4.3	-2.7
Aug 22	0800	C	-1.5	2.2	1.0	2.2	+0.7
Rubus pubescens - Plot 10							
June 19	1100	C	-12.5	8.7	1.0	8.7	-3.8
June 23	1130	C	-13.0	9.2	1.0	9.2	-3.8
June 27	1045	CL	-14.0	8.3	0.5	4.2	-9.8
July 1	1050	O	-4.0	8.3	0.25	2.1	-1.9
July 5	0640	O	-1.5	+0.6	0.25	+0.1	-1.6
July 9	1120	C	-12.5	9.0	1.0	9.0	-3.5
July 13	1145	PC	-13.0	9.5	0.75	7.1	-5.9
July 17	1140	C	-8.0	9.5	1.0	9.5	+1.5
July 21	0710	O	-4.5	0.6	0.25	0.1	-4.4
July 25	0640	H	-2.0	+0.6	0.75	+0.4	-2.4

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
July 29	0940	C	-9.0	6.7	1.0	6.7	-2.3
Aug 2	1015	O	-1.5	7.6	0.25	1.9	+0.4
Aug 6	0750	CL	-5.5	1.7	0.5	0.8	-4.7
Aug 10	1050	O	-9.0	8.0	0.25	2.0	-7.0
Aug 14	0940	O	-5.0	6.7	0.25	1.7	-3.3
Aug 18	0930	C	-10.5	6.1	1.0	6.1	-4.4
Aug 22	0740	O	-0.5	1.7	0.25	0.4	-0.1
Rubus pubescens - Plot 11							
June 11	1300	CL	-12.0	8.7	0.5	4.4	-7.6
June 15	0905	C	-8.5	5.0	1.0	5.0	-3.5
June 19	0755	CL	-6.5	2.2	0.5	1.1	-5.4
June 23	0900	PC	-13.0	5.0	0.75	3.8	-9.2
June 27	1100	CL	-4.5	8.7	0.5	4.4	-0.1
July 1	0825	O	-4.0	3.6	0.25	0.9	-3.1
July 5	0900	O	-2.0	5.0	0.25	1.3	-0.7
July 9	1050	C	-10.5	8.3	1.0	8.3	-2.2
July 13	0840	C	-7.5	4.3	1.0	4.3	-3.2
July 17	0925	C	-7.0	6.1	1.0	6.1	-0.9
July 21	0905	PC	-4.0	5.0	0.5	2.5	-1.5
July 25	0950	C	-5.5	6.7	1.0	6.7	+1.2
July 29	0740	C	-4.0	1.7	1.0	1.7	-2.3
Aug 2	0740	O	-2.5	1.7	0.25	0.4	-2.1
Aug 6	1125	CL	-9.5	9.2	0.5	4.6	-4.9
Aug 10	0740	O	-5.0	1.7	0.25	0.4	-4.6
Aug 14	0835	O	-5.5	3.6	0.25	0.9	-4.6
Aug 18	0740	C	-10.5	1.7	1.0	1.7	-8.8
Aug 22	0935	PC	-12.5	6.1	0.75	9.4	-3.1
Vaccinium myrtilloides - Plot 1							
June 11	0720	C	-14.0	0.4	1.0	0.4	-13.6
June 15	1200	C	-19.0	12.0	1.0	12.0	-7.0
June 19	0920	S	-22.5	5.9	0.75	4.5	-18.8
June 23	1205	PC	-23.0	12.0	0.75	9.0	-14.0
June 27	1200	CL	-12.0	12.0	0.25	3.0	-9.0
July 1	1200	PC	-14.5	12.0	0.75	9.0	-5.5
July 5	1125	CL	-5.0	16.6	0.5	8.3	+3.3
July 9	1230	C	-10.0	10.5	1.0	10.3	+0.3
July 13	1045	C	-16.5	12.5	1.0	12.5	-4.0
July 17	1245	PC	-13.0	9.4	0.75	7.0	-6.0
July 21	0645	O	-3.5	+0.4	0.25	+0.1	-3.6
July 25	1205	H	-9.5	12.0	0.75	9.0	-0.5
July 29	1020	C	-16.0	11.0	1.0	11.0	-5.0
Aug 2	0955	O	-3.0	10.3	0.25	2.6	-0.4
Aug 6	0720	CL	-6.0	0.4	0.5	0.2	-5.8
Aug 10	1005	O	-8.5	10.3	0.25	2.6	-5.9
Aug 10	1005	O	-8.5	10.3	0.25	2.6	-5.9
Aug 14	1020	O	-9.5	11.0	0.25	2.8	-6.7
Aug 18	1030	C	-10.0	11.8	1.0	11.8	+1.8
Aug 22	0700	CL	-2.0	0.0	0.5	0.0	-2.0

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
Vaccinium myrtilloides - Plot 2							
June 3	0825	C	-9.0	3.1	1.0	3.1	-5.9
June 7	1125	C	-21.0	122.	1.0	12.0	-9.0
June 11	0750	C	-18.0	1.3	1.0	1.3	-16.7
June 15	1235	C	-22.0	10.3	1.0	10.3	-11.7
June 19	1150	S	-26.0	12.3	0.75	9.2	-16.8
June 23	1110	C	-26.0	12.9	1.0	12.9	-13.1
June 27	1130	CL	-16.5	12.6	0.5	6.3	-10.2
July 1	1120	O	-6.5	12.9	0.25	3.2	-3.3
July 5	0710	O	-2.0	0.4	0.25	0.1	-1.9
July 9	1210	C	-14.5	11.1	1.0	11.1	-3.4
July 13	1110	C	-20.0	12.9	1.0	12.9	-7.1
July 17	1220	PC	-13.0	11.1	0.75	8.3	-4.7
July 21	0750	O	-4.0	1.3	0.25	0.3	-3.7
July 25	0720	H	-2.5	0.4	0.75	0.3	-2.2
July 29	1000	C	-21.0	10.3	1.0	10.3	-10.7
Aug 2	1040	O	-2.5	12.5	0.25	3.1	+0.6
Aug 6	0830	CL	-10.0	3.1	0.25	0.8	-9.2
Aug 10	1050	O	-13.0	12.5	0.25	3.1	-9.9
Aug 14	1000	O	-6.5	10.3	0.25	2.6	-3.9
Aug 18	1000	C	-18.5	10.3	1.0	10.3	-8.2
Aug 22	0720	CL	-4.5	0.4	0.5	0.2	-4.3
Vaccinium myrtilloides - Plot 3							
June 3	0915	C	-14.0	5.9	1.0	5.9	-8.1
June 7	1225	C	-15.0	10.3	1.0	10.3	-4.7
June 11	0940	C	-15.0	8.8	1.0	8.8	-6.2
June 15	1130	C	-18.5	12.6	1.0	12.6	-5.9
June 19	1030	C	-13.0	11.8	1.0	11.8	-1.2
June 23	0805	S	-7.5	0.0	0.75	0.0	-7.5
June 27	1015	CL	-19.0	11.0	0.5	5.5	-13.5
July 1	0940	O	-2.5	8.8	0.25	2.2	-0.3
July 5	1045	O	-6.0	12.5	0.25	3.1	-2.9
July 9	0710	C	-4.0	0.4	1.0	0.4	-3.6
July 13	0945	C	-15.5	8.8	1.0	8.8	-6.7
July 17	1105	C	-14.0	13.3	1.0	13.3	-0.7
July 21	0850	O	-4.5	3.8	0.25	1.0	-3.5
July 25	0820	H	-6.0	2.4	0.75	1.8	-4.2
July 29	0915	C	-6.5	5.9	1.0	5.9	-0.6
Aug 2	0925	O	-0.5	7.4	0.25	1.8	+1.3
Aug 6	0940	CL	-7.0	8.8	0.5	4.4	-2.6
Aug 10	0905	O	-8.0	4.5	0.25	1.1	-6.9
Aug 14	0915	O	-7.5	5.9	0.25	1.5	-7.0
Aug 18	0910	C	-9.0	5.9	1.0	5.9	-3.1
Aug 22	0815	CL	-1.0	2.4	0.5	1.2	+0.2
Vaccinium myrtilloides - Plot 9							
May 26	0740	C	-4.0	1.3	1.0	1.3	-2.7
May 30	1130	C	-16.0	12.6	1.0	12.6	-3.4
June 3	0950	C	-21.5	8.8	1.0	8.8	-2.7

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
June 7	1010	CL	-20.0	11.0	0.5	5.5	-14.5
June 11	0905	C	-19.0	4.5	1.0	4.5	-14.5
June 15	1050	C	-21.5	12.5	1.0	12.5	-9.0
June 19	1010	C	-12.5	11.0	1.0	11.0	-1.5
June 23	0720	S	-20.5	0.4	0.75	0.3	-20.2
June 27	0935	CL	-16.5	7.4	0.5	3.7	-12.8
July 1	1000	O	-4.0	10.3	0.25	2.6	-1.4
July 5	1035	O	-2.0	11.8	0.25	2.9	+0.9
July 9	0630	C	-3.5	+0.9	1.0	+0.9	+4.4
July 13	0915	C	-18.0	5.9	1.0	5.9	-12.1
July 17	1035	C	-18.5	11.8	1.0	11.8	-6.7
July 21	0825	O	-6.5	3.1	0.25	0.8	-5.7
July 24	0750	H	-4.0	1.3	0.75	1.0	-3.0
July 29	0845	C	-14.0	3.8	1.0	3.8	-10.2
Aug 2	0905	O	-2.5	4.5	0.25	1.1	-1.4
Aug 6	0900	O	-11.5	4.5	0.25	1.1	-10.4
Aug 10	0850	O	-10.5	3.8	0.25	1.0	-9.5
Aug 14	0900	O	-6.0	4.5	0.25	1.1	-4.9
Aug 18	0850	C	-9.0	3.8	1.0	3.8	-5.2
Aug 22	0800	C	-1.5	1.7	1.0	1.7	+0.2
Vaccinium myrtilloides - Plot 10							
May 26	1115	CL	-15.0	12.9	0.5	6.5	-8.5
May 30	1230	CL	-20.0	10.3	0.5	5.1	-14.9
June 3	0810	C	-11.5	2.4	1.0	2.4	-9.1
June 7	1120	C	-22.0	12.9	1.0	12.9	-9.1
June 11	0815	C	-16.5	2.4	1.0	2.4	-14.1
June 15	1310	C	-17.5	8.1	1.0	8.1	-9.4
June 19	1100	C	-11.0	13.3	1.0	13.3	+2.3
June 23	1130	C	-15.0	12.6	1.0	12.6	-2.4
June 27	1045	CL	-16.5	12.5	0.5	6.3	-10.2
July 1	1050	CL	-5.0	12.5	0.25	3.1	-1.9
July 5	0640	O	-2.0	+0.6	0.25	0.2	-2.2
July 9	1120	C	-11.5	12.9	1.0	12.9	+1.4
July 13	1145	PC	-14.5	12.3	0.75	9.2	-5.3
July 17	1140	C	-14.0	12.3	1.0	12.3	-1.7
July 21	0710	O	-4.0	0.4	0.25	0.1	-3.9
July 25	0640	H	-2.0	+0.6	0.75	+0.5	-2.5
July 29	0940	C	-10.0	8.8	1.0	8.8	-1.2
Aug 2	1015	O	-2.0	11.0	0.25	2.8	+0.8
Aug 6	0750	CL	-11.5	1.3	0.5	0.6	-10.9
Aug 10	1025	O	-5.0	11.8	0.25	2.9	-2.1
Aug 14	0940	O	-5.0	8.8	0.25	2.2	-2.8
Aug 18	0930	C	-14.5	7.4	1.0	7.4	-7.1
Aug 22	0740	O	-3.0	1.3	0.25	0.3	-2.7
Vaccinium vitis-idaea - Plot 1							
May 10	1045	C	-16.0	9.8	1.0	9.8	-6.2
May 14	1500	C	-8.0	5.2	1.0	5.2	-2.8
May 18	1105	C	-7.0	10.4	1.0	10.4	+3.4

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
May 22	0745	C	-10.5	1.7	1.0	1.7	-8.8
May 26	1210	CL	-13.0	10.1	0.5	5.1	-7.9
May 30	1330	CL	-13.5	7.8	0.5	3.9	-6.9
June 3	0735	C	-13.5	1.2	1.0	1.2	-12.3
June 7	1100	C	-18.5	10.4	1.0	10.4	-8.1
June 11	0720	C	-8.0	0.6	1.0	0.6	-7.4
June 15	1200	C	-17.5	10.6	1.0	10.6	-6.9
June 19	0920	S	-20.0	5.6	0.75	4.2	-15.8
June 23	1205	PC	-21.5	10.6	0.75	8.0	-13.6
June 27	1200	CL	-16.0	10.6	0.25	2.7	-13.4
July 1	1200	PC	-6.5	10.6	0.75	8.0	+1.5
July 5	1125	CL	-8.0	10.5	0.5	5.3	-2.7
July 9	1230	C	-12.0	9.7	1.0	9.7	-2.3
July 13	1045	C	-24.5	9.8	1.0	9.8	-14.7
July 17	1245	PC	-14.5	9.2	0.75	6.9	-7.6
July 21	0645	O	-3.5	+0.6	0.25	+0.2	-3.7
July 25	1205	H	-8.5	10.6	0.75	8.0	-0.5
July 29	1020	C	-10.0	8.5	1.0	8.5	-1.5
Aug 2	0955	O	-4.0	7.8	0.25	2.0	-2.0
Aug 6	0720	CL	-3.0	0.6	0.5	0.3	-2.7
Aug 10	1005	O	-4.5	7.8	0.25	2.0	-2.5
Aug 14	1020	O	-7.0	8.5	0.25	2.1	-4.9
Aug 18	1030	C	-11.0	9.1	1.0	9.1	-1.9
Aug 22	0700	CL	-3.0	0.0	0.5	0.0	-3.0
Vaccinium vitis-idaea - Plot 2							
May 10	1025	C	-17.0	9.1	1.0	9.1	-7.9
May 14	1430	C	-13.0	6.0	1.0	6.0	-7.0
May 18	1045	C	-11.0	9.8	1.0	9.8	-1.2
May 22	0845	C	-5.0	4.2	1.0	4.2	-0.8
May 26	1150	CL	-9.5	10.6	0.5	5.3	-4.2
May 30	1255	CL	-22.0	8.7	0.5	4.4	-17.6
June 3	0825	C	-23.0	3.6	1.0	3.5	-19.4
June 7	1155	C	-21.0	10.6	1.0	10.6	-10.4
June 11	0750	C	-18.5	1.7	1.0	1.7	-16.8
June 15	1235	C	-24.0	9.7	1.0	9.7	-14.3
June 19	1150	S	-32.0	10.6	0.75	7.9	-24.1
June 23	1110	C	-23.5	10.5	1.0	10.5	-13.0
June 27	1130	CL	-21.0	10.5	0.5	5.3	-15.7
July 1	1120	O	-5.5	10.5	0.25	2.6	-2.9
July 5	0710	O	-2.0	0.6	0.25	0.1	-1.9
July 9	1210	C	-16.5	10.1	1.0	10.1	-6.4
July 13	1110	C	-11.0	10.5	1.0	10.5	-0.5
July 17	1220	PC	-19.0	10.1	0.75	7.6	-11.4
July 21	0750	O	-6.0	1.7	0.25	0.4	-5.6
July 25	0720	H	-3.0	0.6	0.75	0.4	-2.6
July 29	1000	C	-14.0	7.8	1.0	7.8	-6.2
Aug 2	1040	O	-3.5	9.8	0.25	2.4	-1.1
Aug 6	0830	CL	-8.5	3.6	0.25	0.9	-7.6
Aug 10	1050	O	-4.5	9.8	0.25	2.4	-2.1

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
Aug 14	1000	O	-4.5	7.8	0.25	2.0	-2.5
Aug 18	1000	C	-7.0	7.8	1.0	7.8	+0.8
Aug 22	0820	CL	-3.5	0.6	0.5	0.3	-3.2
Vaccinium vitis-idaea - Plot 3							
May 14	1300	C	-5.5	8.7	1.0	8.7	+3.2
May 18	0935	PC	-9.0	6.3	0.75	4.7	-4.3
May 22	1220	C	-13.0	10.1	1.0	10.1	-2.9
May 26	0715	C	-1.0	0.6	1.0	0.6	-0.4
May 30	1035	C	-14.0	9.1	1.0	9.1	-4.9
June 3	0915	C	-11.0	5.6	1.0	5.6	-5.4
June 7	1225	C	-20.5	9.7	1.0	9.7	-10.8
June 11	0940	C	-16.5	7.1	1.0	7.1	-9.5
June 15	1130	C	-20.5	10.5	1.0	10.5	-10.0
June 19	1030	C	-16.5	9.1	1.0	9.1	-7.4
June 23	0705	S	-4.5	0.0	0.75	0.0	-4.5
June 27	1015	CL	-7.5	8.5	0.5	4.2	-3.3
July 1	0940	O	-2.5	7.1	0.25	1.8	-0.7
July 5	1045	O	-5.0	9.8	0.25	2.4	-2.6
July 9	0710	C	-3.5	0.6	1.0	0.6	-2.9
July 13	0945	C	-6.5	7.1	1.0	7.1	+0.5
July 17	1105	C	-9.5	10.4	1.0	10.4	+0.9
July 21	0850	O	-3.0	4.1	0.25	1.0	-2.0
July 25	0820	H	-4.5	2.9	0.75	2.2	-2.3
July 29	0915	C	-4.0	5.6	1.0	5.6	+1.6
Aug 2	0925	O	-2.0	6.3	0.25	1.6	-0.4
Aug 6	0940	CL	-6.5	7.1	0.5	3.5	-3.0
Aug 10	0905	O	-7.0	4.8	0.25	1.2	-5.8
Aug 14	0915	O	-3.0	5.6	0.25	1.4	-1.6
Aug 18	0910	C	-4.0	5.6	1.0	5.6	+1.6
Aug 22	0815	CL	-1.5	2.9	0.5	1.5	-0.0
Vaccinium vitis-idaea - Plot 8							
May 14	1225	C	-10.0	9.7	1.0	9.7	-0.3
May 18	0905	C	-4.0	4.8	1.0	4.8	+0.8
May 22	1125	C	-16.5	10.5	1.0	10.5	-6.0
May 26	0835	C	-1.0	3.6	1.0	3.6	+2.6
May 30	1015	C	-20.0	8.5	1.0	8.5	-11.5
June 3	1320	C	-8.5	7.9	1.0	7.9	-0.6
June 7	0655	C	-13.0	0.0	1.0	0.0	-13.0
June 11	1005	C	-10.5	7.8	1.0	7.8	-2.7
June 15	1015	C	-14.5	8.5	1.0	8.5	-6.0
June 19	0855	S	-17.0	4.8	0.75	3.6	-13.4
June 23	0800	S	-5.5	2.3	0.75	1.7	-3.8
June 27	0905	CL	-9.5	4.8	0.5	2.4	-7.1
July 1	1300	CL	-3.5	8.7	0.5	4.4	+0.9
July 5	0955	O	-1.5	7.8	0.25	2.0	+0.5
July 9	0745	C	-2.5	1.7	1.0	1.7	-0.8
July 13	0645	C	-3.0	+0.6	1.0	+0.6	-3.6
July 17	1000	C	-6.5	7.8	1.0	7.8	+1.3

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
July 21	1100	O	-4.5	10.4	0.25	2.6	-1.9
July 25	1145	H	-13.0	10.6	0.75	7.9	-5.1
July 29	0825	C	-3.0	3.6	1.0	3.6	+0.6
Aug 2	0845	O	-2.0	4.2	0.25	1.0	-1.0
Aug 6	1000	O	-10.0	7.8	0.25	2.0	-8.0
Aug 10	0830	O	-4.5	3.6	0.25	0.9	-3.6
Aug 14	0700	O	-4.0	0.0	0.25	0.0	-4.0
Aug 18	0830	C	-4.0	3.6	1.0	3.6	-0.4
Aug 22	0840	CL	-2.5	4.2	0.5	2.1	-0.4
Vaccinium vitis-idaea - Plot 9							
May 18	0950	C	-8.5	7.1	1.0	7.1	-1.5
May 22	1240	PC	-23.0	9.2	0.75	6.9	-16.1
May 26	0740	C	-3.5	1.7	1.0	1.7	-1.8
May 30	-	-	-	-	-	-	-
June 3	0950	C	-30.5	7.1	1.0	7.1	-23.5
June 7	1300	CL	-32.0	8.7	0.5	4.4	-27.6
June 11	0905	C	-11.5	4.8	1.0	4.8	-6.7
June 15	1050	C	-21.5	9.8	1.0	9.8	-11.7
June 19	1010	C	-24.5	8.5	1.0	8.5	-16.0
June 23	0720	S	-20.0	0.6	0.75	0.4	-19.6
June 27	0935	CL	-19.5	6.3	0.5	3.15	-16.3
July 1	1000	O	-3.5	7.8	0.25	2.0	-1.5
July 5	1035	O	-1.5	9.1	0.25	2.3	-0.8
July 9	0630	C	-3.0	1.1	1.0	+1.1	-4.1
July 13	0915	C	-18.0	5.6	1.0	5.6	-12.4
July 17	1035	C	-20.5	9.1	1.0	9.1	-11.4
July 21	0825	O	-3.5	3.6	0.25	0.9	-2.6
July 25	0750	H	-2.5	1.7	0.75	1.3	-1.2
July 29	0845	C	-7.0	4.2	1.0	4.2	-2.8
Aug 2	0905	O	-2.0	4.8	0.25	1.2	-0.8
Aug 6	0900	CL	-5.0	4.8	0.5	2.4	-2.6
Aug 10	0850	O	-8.5	4.2	0.25	1.0	-7.5
Aug 14	0900	O	-5.0	4.8	0.25	1.2	-3.8
Aug 18	0850	C	-3.5	4.2	1.0	4.2	+0.7
Aug 22	0800	C	-2.0	2.3	1.0	2.3	+0.3
Vaccinium vitis-idaea - Plot 10							
May 14	1400	C	-6.5	6.9	1.0	6.9	+0.4
May 18	1020	C	-7.5	8.5	1.0	8.5	+1.0
May 22	0815	C	-20.5	2.9	1.0	2.9	-17.6
May 26	1115	CL	-7.5	10.5	0.5	5.2	-2.3
May 30	1230	CL	-13.5	9.7	0.5	4.8	-8.7
June 3	0810	C	-11.5	2.9	1.0	2.9	-8.6
June 7	1120	C	-16.0	10.5	1.0	10.5	-5.5
June 11	0815	C	-13.5	2.9	1.0	2.9	-10.6
June 15	1310	C	-24.5	8.5	1.0	8.5	-16.0
June 19	1100	C	-17.0	10.4	1.0	10.4	-6.6
June 23	1130	C	-16.5	10.5	1.0	10.5	-6.0
June 27	1045	CL	-10.0	9.8	0.5	4.9	-5.1

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
July 1	1050	O	-2.0	9.8	0.25	2.4	+0.4
July 5	0640	O	-2.0	+0.8	0.25	+0.2	-2.2
July 9	1120	C	-6.0	10.5	1.0	10.5	+4.5
July 13	1145	PC	-10.5	10.6	0.75	7.9	-2.6
July 17	1140	C	-9.0	10.6	1.0	10.6	+1.6
July 21	0710	O	-3.5	0.6	0.25	0.1	-3.4
July 25	0640	H	-2.0	+0.8	0.75	+0.6	-2.6
July 29	0940	C	-9.0	7.1	1.0	7.1	-2.0
Aug 2	1015	O	-1.0	8.5	0.25	2.1	+1.1
Aug 6	0750	CL	-4.5	1.7	0.5	0.9	-3.6
Aug 10	1025	O	-7.0	9.1	0.25	2.3	-4.7
Aug 14	0940	O	-9.0	7.1	0.25	1.8	-7.2
Aug 18	0930	C	-12.0	6.3	1.0	6.3	-5.7
Aug 22	0740	O	-3.0	1.7	0.25	0.4	-2.6
Viburnum edule - Plot 4							
June 3	1040	C	-9.0	7.3	1.0	7.3	-1.7
June 7	0730	C	-4.5	0.25	1.0	0.25	-4.2
June 11	1030	C	-10.5	6.5	1.0	6.5	-4.0
June 15	0945	C	-11.0	4.6	1.0	4.6	-6.4
June 19	0830	S	-9.0	1.9	0.75	1.4	-7.6
June 23	0825	PC	-7.5	1.9	0.75	1.4	-6.1
June 27	0830	CL	-6.0	1.9	0.5	0.9	-5.1
July 1	0855	O	-6.5	3.3	0.25	0.8	-5.7
July 5	0920	O	-2.0	3.7	0.25	0.9	-1.1
July 9	0815	C	-4.5	1.2	1.0	1.2	-3.3
July 13	0715	C	-4.5	0.1	1.0	0.1	-4.4
July 17	0720	F	-3.5	0.1	0.75	0.1	-3.4
July 21	1030	O	-8.5	6.5	0.25	1.6	-6.9
July 25	0900	H	-3.0	3.3	0.75	2.4	-0.6
July 29	0800	C	-4.0	0.5	1.0	0.5	-3.5
Aug 2	0820	O	-2.5	1.2	0.25	0.3	-2.2
Aug 6	1030	O	-8.0	6.5	0.25	1.6	-6.4
Aug 10	0805	O	-8.5	0.5	0.25	0.1	-8.4
Aug 14	0720	O	-5.5	0.1	0.25	0.0	-5.5
Aug 18	0805	C	-4.0	0.5	1.0	0.5	-3.5
Aug 22	0905	PC	-4.5	3.3	0.75	2.4	-2.1
Viburnum edule - Plot 5							
May 22	0930	C	-7.5	10.3	1.0	10.3	+2.8
May 26	0915	C	-7.0	10.6	1.0	10.6	+3.6
May 30	0800	C	-5.5	1.0	1.0	1.0	-4.6
June 3	1130	C	-14.0	10.0	1.0	10.0	-4.0
June 7	0830	C	-6.5	6.0	1.0	6.0	-0.5
June 11	1130	C	12.5	10.0	1.0	10.0	-2.5
June 15	0755	C	-6.5	1.0	1.0	1.0	-5.5
June 19	0710	CL	-3.5	0.3	0.5	0.1	-3.4
June 23	0955	PC	-14.5	9.5	0.75	7.1	-7.4
June 27	0715	CL	-5.0	0.25	0.5	0.1	-4.9
July 1	0700	O	-3.5	0.0	0.25	0.0	-3.5

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
July 5	0755	O	-1.5	1.0	0.25	0.25	-1.2
July 9	0910	C	-6.5	10.6	1.0	10.6	+4.1
July 13	0810	C	-7.0	3.5	1.0	3.5	-3.5
July 17	0845	C	-9.0	8.5	1.0	8.5	-0.5
July 21	0940	O	-6.0	9.9	0.25	2.5	-3.5
July 25	1015	H	-11.5	9.3	0.75	6.9	-4.6
July 29	0650	C	-2.5	+0.3	1.0	+0.3	-2.8
Aug 2	0650	O	-5.0	+0.3	0.25	+0.3	-5.1
Aug 6	1210	C	-16.0	11.5	1.0	11.5	-4.5
Aug 10	0710	O	-5.5	0.3	0.25	0.1	-5.4
Aug 14	0740	O	-5.5	0.75	0.25	0.2	-5.3
Aug 18	0700	C	-8.5	0.0	1.0	0.0	-8.5
Aug 22	1000	PC	-7.5	9.5	0.75	7.1	-0.4
Viburnum edule - Plot 6							
May 22	1000	C	-6.5	9.5	1.0	9.5	+3.0
May 26	0955	C	-1.0	9.5	1.0	9.5	+8.5
May 30	0835	C	-8.5	6.0	1.0	6.0	-2.5
June 3	1205	C	-12.5	11.5	1.0	11.5	-1.0
June 7	0900	C	-9.5	11.0	1.0	11.0	+1.5
June 11	1205	CL	-15.0	11.5	0.5	5.8	-3.5
June 15	0820	C	-13.0	3.5	1.0	3.5	-9.5
June 19	0645	CL	-5.0	+0.3	0.5	+0.1	-5.1
June 23	0935	PC	-15.5	10.3	0.75	7.7	-7.8
June 27	0750	CL	-8.0	0.8	0.5	0.4	-7.6
July 1	0745	O	-2.0	0.8	0.25	0.2	-1.8
July 5	0815	O	-1.0	3.5	0.25	0.9	-0.1
July 9	0910	C	-6.5	10.6	1.0	106	+4.1
July 13	0745	C	-7.0	0.8	1.0	0.8	-6.2
July 17	0810	C	-7.0	3.5	1.0	3.5	-3.5
July 21	0925	CL	-13.0	10.3	0.25	2.6	-10.4
July 25	1035	H	-15.0	9.0	0.75	6.8	-8.2
July 29	0710	C	-2.5	0.3	1.0	0.3	-2.2
Aug 2	0705	O	-4.0	0.0	0.25	0.0	-4.0
Aug 6	1145	CL	-10.8	10.7	0.5	5.4	-5.1
Aug 10	0650	H	-3.0	+0.3	0.75	0.2	-3.2
Aug 14	0805	O	-6.5	1.0	0.25	0.3	-6.2
Aug 18	0710	C	-4.5	0.3	1.0	0.3	-4.2
Aug 22	1015	PC	-12.0	9.3	0.75	6.9	-5.1
Viburnum edule - Plot 9							
May 22	1240	PC	-10.5	14.3	0.75	10.7	+0.2
May 26	0740	C	-4.0	4.5	1.0	4.5	+0.5
May 30	1130	C	-13.0	14.8	1.0	14.8	+1.8
June 3	0950	C	-17.0	12.6	1.0	12.6	-4.4
June 7	1300	CL	-16.5	14.3	0.5	14.3	-2.2
June 11	0905	C	-10.5	11.5	1.0	11.5	+1.0
June 15	1050	C	-14.0	14.5	1.0	14.5	+0.5
June 19	1010	C	-13.5	13.5	1.0	13.5	-0.0
June 23	0720	S	-11.0	1.5	0.75	1.1	-9.9

APPENDIX II. Continued.

Date	Time	A	B	C	D	E	F
June 27	0935	CL	-9.5	12.3	0.5	6.1	-3.4
July 1	1000	O	-7.5	13.0	0.25	3.3	-4.2
July 5	1035	O	-4.5	14.0	0.25	3.5	-1.0
July 9	0630	C	-5.5	+3.0	1.0	+3.0	-8.5
July 13	0915	C	-14.0	11.9	1.0	11.9	-2.1
July 17	1035	C	-13.5	14.0	1.0	14.0	+0.5
July 21	0825	O	-3.5	8.8	0.25	2.2	-1.3
July 25	0750	H	-3.5	4.5	0.75	3.4	-0.1
July 29	0845	C	-10.0	10.1	1.0	10.1	+0.1
Aug 2	0905	O	-2.0	11.5	0.25	2.9	+0.9
Aug 6	0900	O	-7.5	11.5	0.25	2.9	-4.6
Aug 10	0850	O	-8.0	10.1	0.25	2.5	-5.5
Aug 14	0900	O	-6.0	11.5	0.25	2.9	-3.1
Aug 18	0850	C	-7.0	10.1	1.0	10.1	+3.1
Aug 22	0800	C	-1.5	6.0	1.0	6.0	+4.5
Viburnum edule - Plot 10							
May 22	0815	C	-7.0	1.2	1.0	1.2	-5.8
May 26	1115	CL	-7.0	-7.8	0.5	3.9	-3.1
May 30	1230	CL	-11.0	7.9	0.5	3.9	-7.1
June 3	0810	C	-6.5	1.2	1.0	1.2	-5.3
June 7	1120	C	-12.5	7.8	1.0	7.8	-4.7
June 11	0815	C	-6.5	1.2	1.0	1.2	-5.3
June 15	1310	C	-13.5	9.0	1.0	9.0	-4.5
June 19	1100	C	-9.5	8.0	1.0	8.0	-1.5
June 23	1130	C	-10.5	7.5	1.0	7.5	-3.0
June 27	1045	CL	-9.5	7.3	0.5	3.6	-5.9
July 1	1050	O	-4.0	7.3	0.25	1.8	-2.2
July 5	0640	O	-1.5	0.2	0.25	0.1	-1.4
July 9	1120	C	-13.0	7.8	1.0	7.8	-5.2
July 13	1145	PC	-14.0	7.3	0.75	5.4	-8.6
July 17	1140	C	-10.0	7.3	1.0	7.3	-2.7
July 21	0710	O	-3.0	0.1	0.25	0.0	-3.0
July 25	0640	H	-2.5	0.2	0.75	0.2	-2.3
July 29	0940	C	-6.0	4.6	1.0	4.6	-1.4
Aug 2	1015	O	-2.5	5.8	0.25	1.4	-1.1
Aug 6	0750	CL	-4.5	0.4	0.5	0.2	-4.3
Aug 10	1025	O	-6.5	6.5	0.25	1.6	-4.9
Aug 14	0940	O	-5.0	4.6	0.25	1.1	-3.9
Aug 18	0930	C	-9.5	4.1	1.0	4.1	-5.4
Aug 22	0740	O	-2.0	0.4	0.25	0.1	-1.9
Viburnum edule - Plot 11							
June 11	1300	C	-11.5	8.8	0.5	4.4	-7.1
June 15	0905	C	-12.5	3.3	1.0	3.3	-9.2
June 19	0755	CL	-4.5	0.5	0.5	0.3	-4.2
June 23	0900	PC	-13.5	3.3	0.75	2.4	-11.1
June 27	1100	CL	-5.0	8.0	0.5	4.0	-1.0
July 1	0825	O	-4.0	1.9	0.25	0.5	-3.5
July 5	0900	O	-3.5	3.3	0.25	0.8	-2.7

APPENDIX II. Concluded.

Date	Time	A	B	C	D	E	F
July 9	1050	C	-13.0	7.3	1.0	7.3	-5.7
July 13	0840	C	-7.5	2.6	1.0	2.6	-4.9
July 17	0925	C	-10.0	4.1	1.0	4.1	-6.9
July 21	0905	CL	-7.0	3.3	0.5	1.6	-5.4
July 25	0950	C	-9.5	4.6	1.0	4.6	-4.9
July 29	0740	C	-3.0	0.4	1.0	0.4	-2.6
Aug 2	0740	O	-2.0	0.4	0.25	0.1	-1.9
Aug 6	1125	C	-7.0	7.5	0.5	3.8	-3.2
Aug 10	0740	O	-6.0	0.4	0.25	0.1	-5.9
Aug 14	0835	O	-6.0	1.9	0.25	0.5	-5.5
Aug 18	0740	C	-8.0	0.4	1.0	0.4	-7.6
Aug 22	0935	PC	-8.0	4.1	0.75	3.1	-4.9

VITA

NAME: Wayne L Strong

PLACE OF BIRTH: Edmore, Michigan, USA

YEAR OF BIRTH: 1951

POST-SECONDARY EDUCATION AND DEGREES:

Central Michigan University
Mt. Pleasant, Michigan
1969-1973, B.S.

University of Calgary
Calgary, Alberta
1973-1977, M.Sc.

University of Alberta
Edmonton, Alberta
1980-1984, Ph.D. (Plant Ecology)

RELATED WORK EXPERIENCE:

Teaching/Research Assistant
University of Calgary
1973-1975

Biophysical Analyst
Independent Consultant
1974-1977

Project Leader and Ecological Analyst
Resource Evaluation and Planning Branch
Alberta Energy and Natural Resources
1977-1982

Senior Ecologist and Manager
Ecological Land Surveys Ltd.
1982 - present

PUBLICATIONS AND TECHNICAL REPORTS:

Cordes, L.D., S. Hartwell, and W.L Strong. 1975. Environmental Assessment of the Pine Lake Area, Wood Buffalo National Park. National and Historic Parks Branch, Dept. of Indian Affairs and Northern Development. Research Contract 585-74-19.

Hartwell, S., and W.L Strong. 1975. Environmental Assessment of the Pine Lake Area, Wood Buffalo National Park - Continued Monitoring of Trampling Plots and Exclosures. National and Historic Parks Branch, Dept. of Indian Affairs and Northern Development. Reseach Contract 585-75-69.

Strong, W.L. 1975. Pre- and postsettlement palynology of southern Alberta. M.Sc. Thesis, University of Calgary, Calgary, Alberta.

Cordes, L.D., and W.L Strong. 1976. Vegetation Change in the Peace-Athabasca Delta 1974-1975. National and Historic Parks Branch, Dept. of Indian Affairs and Northern Development. Research Contract 585/74-54.

Strong, W.L, and L.D. Cordes. 1976. A coring method for lake surface sediments. Canadian Journal of Earth Sciences, 13:1331-1333.

Strong, W.L. 1977. Pre- and postsettlement palynology of southern Alberta. Review of Palaeobotany and Palynology, 23:373-383.

------- 1978. Evidence of *Picea pungens* in north-central Montana and its significance. Canadian Journal of Botany, 56:1118-1121.

------- 1978. Biophysical land classification and evaluation of capability - Lakeland. Alberta Energy and Natural Resources, Edmonton, Alberta. Publication No. 63.

------- 1979. Ecological land classification and evaluation - Livingstone-Porcupine. Alberta Energy and Natural Resources, Edmonton, Alberta. Publication No. 94.

Strong, W.L, and H.G. Anderson. 1979. Ecological land classification map symbolization. Canada Committee on Ecological Land Classification - Newsletter No. 8.

Strong, W.L, and H.G. Vriend. 1980. Ecological land classification hierarchies and elk distributions in southwestern Alberta. Pages 99-106. *In* D.G. Taylor. *Editor*. Land/Wildlife Integration. Environment Canada, Lands Directorate, Ecological Land Classification Series, No. 11.

Strong, W.L. 1980. Ecological land classification - Fort McMurray Energy Corridor. Alberta Energy and Natural Resources, Edmonton, Alberta.

-------- 1980. Ecological land classification - Swartz Lake area. Alberta Energy and Natural Resources, Edmonton, Alberta. ENR Report No. T/11.

Strong, W.L, and K.R. Leggat. 1981. Ecoregions of the Edmonton Regional Planning Commission. Alberta Energy and Natural Resources, Edmonton, Alberta.

-------- 1981. Ecoregions of Alberta. Alberta Energy and Natural Resources, Edmonton, Alberta. Technical Report No. T/4.

Strong, W.L, and A. Limbird. 1981. A key for systematically classifying soils to the subgroup level as based on the Canadian System of Soil Classification. Canadian Journal of Soil Science, 61:285-294.

Strong, W.L. 1981. Ecological land classification and evaluation - Jean D'Or Prairie. Alberta Energy and Natural Resources, Edmonton, Alberta. ENR Technical Report No. T/11-5.

-------- 1982. Ecological land classification and evaluation - Frost Hills area. Alberta Energy and Natural Resources, Edmonton, Alberta. ENR Technical Report No. T/11-6.

-------- 1982. Ecological land classification and evaluation - Swan Hills Townsite Area. Alberta Energy and Natural Resources, Edmonton, Alberta. ENR Technical Report No. T/11-7.

Strong, W.L, and G.H. La Roi. 1983. Rooting depth and successional development of selected boreal forest communities. Canadian Journal of Forest Research, 13:577-588.

-------- 1983. Roots-system morphology of common boreal forest trees. Canadian Journal of Forest Research, 13:1164-1173.

-------- 1984. Seasonal plant-soil water relationships in selected boreal forest communities of central Alberta. Canadian Journal of Forest Research, (Submitted 1984).

Strong, W.L, and B. MacCallum. 1984. A preliminary vegetation and wildlife analysis of the Fort Saskatchewan Restricted Development area. Prepared for Alberta Environment, Edmonton, Alberta.

Strong, W.L, and G.H. La Roi. 1984. Root density - soil relationships in selected boreal forests of central Alberta. Forest Ecology and Management, (Submitted - August 1984).